

Points of Pride

John A. Volpe National Transportation Systems Center

Fiscal Year 2005



U.S. Department of Transportation
Research and Innovative Technology Administration



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From the Director

As the John A. Volpe National Transportation Systems Center celebrates its 35th year of service to the U.S. Department of Transportation and the Nation, it is fitting to view a cross-section of the Center's contributions during the past 12 months and thereby gain a sense of the breadth, the depth of impact, and the value delivered by the Volpe Center.

This compilation of fiscal year 2005 accomplishments illustrates the Volpe Center's vital role as a unique Federal resource within the Department's Research and Innovative Technology Administration (RITA) — an organization that continues to earn respect and appreciation from its clients and stakeholders across all modes of transportation.

Each accomplishment is aligned with the Department's strategic national transportation goals:

safety, security, mobility, global connectivity, environmental stewardship or the Federal government's principle management objective of achieving 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 national goal. The Center is committed to helping its clients achieve these goals through safer, simpler, and smarter transportation solutions.

The Points of Pride identified in this document exemplify the Volpe Center's tradition of providing outstanding support to the U.S. Department of Transportation (DOT), other organizations in the Executive Branch, and the broader transportation community.

Curtis J. Tompkins

Safety

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

Aviation Safety

Runway Incursion Severity Calculation Model

On average, one runway incursion occurs per day and one close call occurs every ten days. The Volpe Center, on behalf of the Federal Aviation Administration (FAA), has developed the Runway Incursion Severity Categorization model to classify the severity of runway incursions. The model is a computer-based “expert system” designed to provide an objective rating of each runway incursion. Objective data and some category judgments about incursion scenarios and other factors are fed into the computer by airport controllers and quality assurance personnel. The computer generates a rating using algorithms based on look-up table constraints and factor weightings. This system is meant to augment current FAA committee reviews and voting procedures. Currently, FAA, as well as Australian, the United Kingdom, and the International Civil Aviation Organization (ICAO) agencies are evaluating the model. It is being considered as an international tool for the global standardization of the severity of runway incursions. *(Sponsored by FAA)*

Runway Status Lights at San Diego International Airport

In March 2005, the Volpe Center completed installation of Runway Status Lights (RWSL) at San Diego International Airport. The RWSL will play a major part in reducing future runway incursions, the FAA’s number one safety priority. The RWSL are installed at critical airport runway intersections and

will provide pilots with an indication of runway occupancy. The lights are directly driven by airport surface radar and address a National Transportation Safety Board call for a positive indication of runway occupancy to air crews, independent of air traffic control. The Volpe Center was an integral part of the FAA team to integrate the lights with airport surface radar and airport operations. An operational evaluation of the RWSL at San Diego International Airport will commence in FY 2006. *(Sponsored by FAA)*

Aircraft Repair Station Safety Risk Model

The Volpe Center developed and released major enhancements to the Safety Performance Analysis System (SPAS) that provide FAA inspectors worldwide with critical analytical capabilities needed to assess the safety performance of airline maintenance contractors. The new capabilities address FAA safety priorities stemming from the fatal Air Midwest airline crash in 2003 where contract aircraft maintenance was identified as a major factor in the crash. They also correct deficiencies in FAA processes that were cited by the DOT’s Office of the Inspector General in investigations of FAA repair station oversight. Major enhancements to the SPAS Repair Station Analysis Model and the Contractor section of the Air Operator Profile now provide the FAA with effective tools for monitoring and assessing the safety risk of contract aircraft repair stations. This is increasingly important because most airlines are now using these stations through outsourcing arrangements to repair and maintain their aircraft. The task was completed concurrently with the transition of SPAS system operations from the Volpe Center to the FAA’s

computer operations center in Oklahoma City. By completing the development of the SPAS repair station analysis capabilities while successfully transitioning the operations to the FAA, the Volpe Center has helped the FAA meet its strategic goals of increasing safety while reducing operational costs. *(Sponsored by FAA)*

East Coast Deployment of Automatic Dependent Surveillance-Broadcast

During FY 2005, the Volpe Center conducted site surveys and installations at twelve sites of the FAA Safe Flight 21 Program's East Coast Network of Automatic Dependent Surveillance-Broadcast (ADS-B) ground-based transceivers (GBTs). The East Coast ADS-B Network GBTs provide uplinks of surveillance data for local traffic and regional flight information services (weather and Notices to Airmen) to general aviation aircraft. The East Coast GBT network represents the first U.S. installation of ADS-B ground stations. It is a demonstration of the key surveillance technology that will permit a movement away from expensive ground-based radar and toward a space-based National Airspace System (NAS) infrastructure. The space-based NAS-infrastructure is the key to the Joint Program Development Office's Next Generation Air Transportation System vision for the 2025 NAS. *(Sponsored by FAA)*

Aviation Safety Technology Assessment

September 30, 2005, marks the end of National Aeronautic and Space Administration's (NASA's) five-year effort to develop and demonstrate technologies that contribute to a reduction in the aviation fatal accident rate by a factor of five. The NASA Aviation Safety and Security Program is currently wrapping up their research efforts and focusing on implementation of their safety technologies. For the past four years, the Volpe Center has been working with NASA and helping with technology assessment by conducting cost/benefit analyses. The safety technologies encompass a wide range of technologies that require both public and private investment. The Volpe Center has been working closely with government and private industry in efforts to identify the public need and to gain industry acceptance. This year marked the completion of three technology concept of operation workshops hosted by NASA to present the final safety technologies, the safety benefits of the technologies, and the additional operational improvements to the airlines. Attendance at the workshops included representatives from the Air Transport Association, Airline Pilots Association, Flight Safety Foundation, Boeing Commercial, Rockwell Collins, Honeywell,

Gulfstream, American Airlines, US Airways, United Airlines, Northwest, Alaska/Frontier, JetBlue, AirTran, Southwest, Federal Express, the United Parcel Service, and the U.S. Departments of Commerce, Defense and Transportation. *(Sponsored by NASA)*

Novel Approach to Driving Simulation

The Volpe Center demonstrated a cost-effective means to test human drivers for research and training that provides perfect motion sensation and at the same time exposes drivers to sudden unexpected collision hazards. This is accomplished by having the driver drive an actual vehicle in an obstacle-free environment where the driver's frontal view is a high-resolution projection from a video camera. The collision hazard is a computer generated virtual object (e.g., other vehicle or pedestrian) that is superposed on the video scene and is visually aligned with the actual roadway and moving independently of the driven vehicle. This approach can be used in lieu of current motion-based driving simulators that cost \$10-80 million and, even at that price, do not provide perfect motion sensation. NASA supported this work because of its interest in helping airport tower controllers identify aircraft on taxiways and ramps by superposing text or symbolic information on the actual view (through binoculars or a video display). *(Sponsored by NASA)*

Rail Safety

Acela Express Disk Brakes

In April 2005, cracks were discovered in the disk brakes on Acela Express coach cars in service in the Northeast Corridor. After determining that the cracks existed in more than one train, Amtrak removed the Acela Express fleet from service. Cracks were occurring in the spokes of the disks after as little as 200,000 miles of operation. The Volpe Center has been assisting the Federal Railroad Administration (FRA) and Amtrak in assessing the cracked spoke problem and identifying possible causes. In addition, the new disk has been evaluated to determine whether the likely failure mode has been addressed. Failures were related to a vibration of the disk excited by brake applications and vertical bumps in the track at such appliances inter-locking and insulated joints. These failures were similar to a disk brake problem addressed 20 years ago with earlier Amtrak equipment. *(Sponsored by FRA)*

Amtrak's Passenger Accounting System

In investigating the derailment of Amtrak's Auto Train on

April 18, 2002, the National Transportation Safety Board (NTSB) reported that an accurate count of persons on the train at the time of the accident was unavailable. NTSB noted that emergency response would be improved with accurate count data at the accident scene and issued a Safety Recommendation to the FRA that it develop and implement an accurate passenger accounting system. At FRA's request, the Volpe Center assessed the weaknesses in Amtrak's passenger accounting system, the costs of improving it, and the potential safety and business benefits of an improved system. By working with emergency responders and Amtrak staff, the Volpe Center provided the FRA with strong supporting documentation that could be used in its response to NTSB: while technically feasible, the recommendation is impractical given Amtrak's business model and would not provide the desired safety benefits. Since the finding is contrary to NTSB's position, it was critical to solicit the views of many stakeholders and integrate them into a comprehensive analysis supporting the Volpe Center's conclusions. To implement the NTSB recommendation would take at least \$40 million in capital costs and \$7 million annual operating costs. The Volpe Center work also identified alternative improvements to Amtrak's passenger accounting system that can be the basis for future cost-effective Amtrak initiatives. *(Sponsored by FRA)*

Confidential Close Call Reporting System for Railroad Industry

The DOT is working towards 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 the FRA, railroad carriers, and labor organizations to develop a demonstration program to evaluate the effectiveness of a close call reporting system. Consensus among the key stakeholders was critical to the project moving forward because a close call system only succeeds when stakeholders volunteer information about close call incidents. The development of this system will enable the railroad industry to take action to prevent hazardous events before they occur. *(Sponsored by FRA)*

Passenger Rail Equipment Crashworthiness

Last January, a serious accident occurred in Glendale, California. The crash involved a collision of a commuter rail

train with a highway vehicle, the subsequent derailment, and then a collision with a standing freight train and another moving commuter rail train. Immediately following the accident, FRA deployed a Volpe Center team to Glendale to develop a detailed accident reconstruction that was useful in determining where improvements in car structures could have made a difference. The Volpe Center's passenger rail equipment crashworthiness team had been developing alternative structural designs for the FRA to substantially increase passenger and operator survivability by effectively managing the energy during collisions. The team also developed several executive-level briefings that resulted in a request for assistance by Metrolink (the commuter rail operating authority in greater Los Angeles), to include crash energy management concepts in a planned procurement of new equipment. The FRA views this request as an extremely important indicator of the program's relevance and significance. The American Public Transit Association has joined the effort to make the crash energy management specifications broadly accepted practice for all new rail car purchases. *(Sponsored by FRA)*

Transit Safety

State Safety Oversight Program for the Federal Transit Administration

The Federal Transit Administration's (FTA's) State Safety Oversight Program for Rail Fixed Guideway Systems promotes the use of management and engineering principles to identify and resolve safety hazards and security vulnerabilities. This year, the Volpe Center conducted safety and security readiness assessments in Salt Lake City, Utah; Minneapolis, Minnesota; and San Juan, Puerto Rico. Federal legislation requires that all rail transit systems develop safety plans that address security. For several years, the Volpe Center has been lending assistance to the FTA State Safety Oversight Program, and has created guidelines for developing transit security procedures and programs. The Center disseminates this guidance through a website, workshops, newsletters, and training courses. *(Sponsored by FTA)*

Motor Vehicle Safety

National Motor Vehicle Crash Causation Study

Congress mandated the National Highway Traffic Safety Administration (NHTSA) to initiate a FY 2005 program to col-

lect data on the causes of highway crashes and to make the data available to the automobile industry and to researchers. This effort was largely unprecedented since all previous NHTSA crashworthiness work had been based on post-crash data rather than on pre-crash causation data. The Volpe Center was responsible for developing the software and network that would allow the causation data to be collected, analyzed and disseminated. The challenge was to have the software and network available for the planned start date for collection while the data requirements, and the coding and editing of that data continued to be modified by NHTSA researchers and statisticians. By working closely with NHTSA staff and working extra hours and weekends, the Volpe Center delivered the software in time for the nationwide team of researchers to achieve their mandatory start date. *(Sponsored by NHTSA)*

Rear-End Crash Avoidance System Evaluation

The Volpe Center has completed a five year program to evaluate an automotive rear-end crash avoidance system for NHTSA. This system is designed to prevent rear-end crashes of which four million occur every year in the United States. Built by General Motors and Delphi, this system alerts the driver to an impending rear-end collision and provides adaptive cruise control capability that maintains preselected speed and headway. The Volpe Center conducted an independent evaluation to estimate the safety benefits and determine driver acceptance of this system. The Volpe Center broke new ground in conducting an assessment of automotive safety technologies using limited field operational test data. The Center developed new evaluation frameworks, devised novel methodologies, and built various data mining tools. National and international research organizations have praised and adopted many of these developments. The results of this evaluation showed that this system has the potential to prevent over 25 percent of rear-end crashes. Based on lessons learned, the Volpe Center made recommendations to the DOT for improving future field operational tests of advanced technology automotive safety systems being planned for the Intelligent Transportation Systems program. *(Sponsored by NHTSA)*

Child Safety in School Buses and Passenger Vehicles

This year, the Volpe Center collaborated with NHTSA to co-author two papers: "Child Safety Research in School Buses," and "Child Safety in Light Vehicles." The papers were delivered at the 19th International Conference on the Enhanced Safety of Vehicles in Washington, D.C. The conference was widely attend-

ed by industry, academia, and government officials from Europe, Asia, and North America and was hosted by DOT Secretary Norman Y. Mineta. The bi-annual conference provides an international forum for research on motor vehicle safety. The participants were able to discuss state-of-the-art research with industrial, regulatory, and academic stakeholders from around the world. *(Sponsored by NHTSA)*

Motor Carrier Safety

SafeStat: A New Standard for Motor Carrier Safety Measurement

In the late 1990s, the Volpe Center formulated, developed and implemented improved processes for evaluating the safety performance and compliance of interstate motor carriers for the Federal Motor Carrier Safety Administration (FMCSA) and the use of these processes in the implementation of its safety improvement programs. The heart of these new processes is SafeStat, an automated, data-driven algorithm that incorporates safety data from multiple sources, measures the relative safety status of individual motor carriers and prioritizes unsafe carriers for FMCSA on-site compliance reviews, roadside inspections, and enforcement. SafeStat was adopted by FMCSA for use nationwide and has given the Volpe Center worldwide name recognition in the area of motor carrier safety analysis and information systems.

In FY 2005, the Volpe Center supported production of the monthly SafeStat results that direct the FMCSA's major enforcement programs and developed and implemented a methodology to assess the effectiveness of the SafeStat algorithm in identifying and ranking unsafe motor carriers. The methodology was employed to develop several major enhancements to the algorithm and incorporate a new traffic violations indicator. These changes improve effectiveness of the algorithm and the consistency of the crash ratings among carriers. The SafeStat enhancements were presented to and enthusiastically received by the FMCSA Administrator, FMCSA senior staff, and field enforcement staff. Ultimately, these enhancements will allow FMCSA to more efficiently and effectively target its limited resources as it moves toward achieving its goal of reducing the large truck fatality rate. *(Sponsored by FMCSA)*

State-level Annual Safety Planning Support

State-level annual motor carrier safety plan preparation has become one of the top initiatives for the FMCSA Administrator

and the Chief Safety Officer. FMCSA Division Administrators in each state are now required to prepare an annual plan to reduce truck-related crashes and fatalities to meet their share of the DOT safety goal. In order to receive FMCSA grant funds, all 50 states are required to produce an annual statewide Commercial Vehicle Safety Plan.

In support of these requirements, the Volpe Center formed a team that developed and piloted a four-step planning process, including problem identification, countermeasure alternatives and selection, implementation strategy, and results monitoring. The team piloted the process and developed training on it with three New England states and then conducted the training in all FMCSA Service Center regions for all 50 FMCSA State Division Offices and their state counterpart agencies. In developing the training content, the Volpe Center showcased the Analysis & Information (A&I) web-based analytical system — also developed and maintained by the Volpe Center for the FMCSA — as an information resource. The Volpe Center team demonstrated its interpersonal communication and analytical skills as well as in-depth knowledge of FMCSA safety programs and operations. For the first time, FMCSA has a consistent, comprehensive approach to prioritizing their programs and assigning resources at the state level and has the knowledge of the existing information sources needed to develop the plans. States also now have a consistent framework for developing plans required by FMCSA. *(Sponsored by FMCSA)*

Electronic On-Board Recorders Rulemaking Support

On July 16, 2004, the U.S. Court of Appeals for the District of Columbia Circuit vacated FMCSA's rules concerning hours of service (HOS) for commercial motor vehicle (CMV) drivers. Although the Court's reasons were not directly related to vehicle electronic on-board recorders (EOBRs), the Court required FMCSA to collect and analyze data on the costs and benefits for potentially mandating the use of EOBRs in lieu of handwritten driver HOS logs. In September 2004, FMCSA issued an Advance Notice of Proposed Rulemaking for that purpose. Within an extremely short time frame, the agency had to synthesize all EOBR information and formulate recommendations on their potential use in satisfying HOS recording requirements for a new rule. Several issues required evaluation, such as the ability of EOBRs to reliably identify individual drivers, to resist electronic and physical tampering, and to produce adequate records for roadside inspection and audits, protection of proprietary

operational and personal information, carrier acquisition and operating costs, and driver acceptability. The significant scope of this rulemaking, potentially affecting thousands of CMVs and drivers, made it an FMCSA priority.

In October 2004, FMCSA requested the Volpe Center to conduct the entire EOBR evaluation and produce findings by March 15, 2005. An interdisciplinary team consisting of staff from several Volpe Center technical divisions was formed and tasked to perform the evaluation. Working closely with FMCSA, a report, "Recommendations Regarding the Use of Electronic On-Board Recorders (EOBRs) for Reporting Hours of Service (HOS)," was produced and delivered on schedule. The FMCSA project manager commended the Volpe Center on the systems approach taken and on the quality and responsiveness of the work. In addition, a third-party technical peer review by the National Institute of Standards and Technology has confirmed the quality and comprehensiveness of the effort. *(Sponsored by FMCSA)*

Motor Carrier Safety Knowledge Transfer Program

In the past year, the Volpe Center provided exceptional leadership in its efforts to support the FMCSA's Creating Opportunities, Methods, and Processes to Secure Safety (COMPASS) program, which will modernize and streamline the agency's safety business processes. COMPASS will result in more effectively and efficiently reaching the agency's goal of reducing highway fatalities due to truck and bus accidents. The knowledge base regarding safety information systems that are the core elements of COMPASS reside at the Volpe Center, and the initial effort for this initiative involved an enormous amount of knowledge transfer between the Volpe Center staff, their counterparts in FMCSA, and a new Systems Integrator. Nearly 300 technical documents were written in approximately six months. These documents were stored and shared within the COMPASS team using FMCSA's Electronic Document Management System, also developed by the Volpe Center. In addition, a COMPASS Integration Environment was created to aid in the system development effort. FMCSA subsequently recognized this exceptional effort by awarding each of the eight members of the Volpe Center team with a 'Special Act Award' citing the "highest level of professionalism, enthusiasm, and dedication" of the team effort. This knowledge transfer activity led to the timely interaction of the FMCSA staff with the Systems Integrator and development activities to commence. *(Sponsored by FMCSA)*

Pipeline and Hazardous Material Safety

Safety Monitoring and Reporting Tool for Pipeline Safety

In July 2005, a user acceptance test was held at the Volpe Center marking the completion of the start-up phase and the release of the beta version of the Safety Monitoring and Reporting Tool (SMART). SMART was developed by the Volpe Center for the Pipeline and Hazardous Materials Safety Administration's Office of Pipeline Safety (PHMSA/OPS). SMART provides a new enforcement application leveraging workflow and lays the foundation for providing document management and query applications to access data originating within the Pipeline Incident Processing and Enforcement System (PIPES) and Integrated Operator Compliance System (IOCS) databases. SMART provides structure to the enforcement process using workflow technology and standardizes headquarters and region best practices on enforcement activities. This start-up capability enables OPS to use a variety of enforcement tools more effectively, including some, such as compliance orders, that require pipeline operators to correct underlying safety violations. OPS may also impose monetary sanctions (civil penalties) on pipeline operators for violations of its pipeline safety regulations and SMART supports the tracking and collection of these penalties. SMART is a good example of the application of technology transfer within the Volpe Center. Much of the

technology, concepts, and design techniques used in SMART were derived from current and former projects worked on by the SMART development team. These include the FAA's Safety Performance Analysis System (SPAS), DoD's Air Carrier Analysis System (ACAS), and NHTSA's Artemis System. (*Sponsored by PHMSA*)

Evaluating the Risk of Rail Transport of Hazardous Materials

The Volpe Center has been providing technical support to the FRA in its Rail Equipment Safety Research Program for over twenty years. One part of this research program is a project on the Structural Integrity of Railroad Tank Cars. During the past year, the Volpe Center has developed and is implementing a research plan and assessment methodology to support the FRA in evaluating the risk of rail transport of hazardous materials. The work addresses safety recommendations made by the NTSB regarding a train derailment and subsequent release of hazardous materials that occurred in Minot, North Dakota on January 18, 2002. One of the primary focal points of this work is the evaluation of the fracture toughness of the steels used in cars built before 1989. The Volpe Center's work on this project began in March 2004, shortly after the NTSB released its investigation report on this accident. The plan addresses some of the most complex issues in materials engineering, collision and derailment dynamics, and risk management. (*Sponsored by FRA*)

DOT Strategic Goal

Mobility

Advance accessible, efficient, intermodal transportation for the movement of people and goods

The Enhanced Traffic Management System (ETMS) 8.0

The Volpe Center's FAA client described the operational deployment of the ETMS version 8.0 on June 6, 2005, as "a tremendous success." The Center's ETMS team was commended for their "true professionalism and commitment over the long-term planning for this day." One of the busiest days in the spring 2005 air traffic season was June 6. ETMS is the center of FAA's traffic flow management infrastructure for Collaborative Decision-Making between FAA and the National Airspace System users. ETMS 8.0 required an enormous effort of porting the Volpe Center's Hubsite applications software to a new operating system. In addition, FAA requested several new traffic management enhancements in ETMS 8.0. The deployment advanced the Department's strategic goals of mobility and safety because hundreds of national air traffic management initiatives including ground delay programs, ground stops, and reroutes have been handled smoothly since deployment of the new version of ETMS. *(Sponsored by FAA)*

Modernization of the FAA's Traffic Flow Management (TFM) Infrastructure

The aging computers at the Volpe Center's ETMS Hubsite and over 77 FAA field sites were successfully transformed to new state-of-the-art computers and telecommunications equipment during FY 2005. The old computers, which had been acquired in advance of Y2K, were over seven years old. They had been routinely operating at over 90 percent and in some cases 100 percent capacity and had been unable to keep up with the

demand associated with increasing air traffic over the years. The new technology represents an order of magnitude increase in processing speed and provides significant capacity for future growth in air traffic as the U.S. economy expands. The spring/summer 2005 air traffic season has been the busiest period of air travel since 2000. Even on the busiest days this year, the new technology at Volpe Center's ETMS Hubsite is operating at less than 20 percent capacity. The Volpe Center staff were key players in specification of the new technology, test, and deployment. Volpe Center teams traveled to all 77 FAA field sites for transition training for FAA staff around the country. Since completion of the TFM Tech Refresh, users have been effusive with praise for the performance of the new technology. *(Sponsored by FAA)*

Expanded Volpe Center Role in New Traffic Flow Management Modernization Program

In late FY 2004, FAA issued a new contract to develop the next generation Traffic Flow Management Modernization (TFMM) program. At the time, Volpe Center's future role in TFM was envisioned to be limited to modest enhancements and maintenance of the legacy system and unspecified future research tasks. As a result of the flexibility and value added knowledge of the Volpe Center's TFM team members, the Center was called upon to provide several thoughtful analyses. Important components of the Center's work were well received by the FAA's TFMM Program Office. Now one year after TFMM contract award, the Volpe team's value to the TFMM program has been recognized and the Center's work in this important

new initiative has been increased significantly. Active discussions are underway about how to best integrate the Volpe Center's corporate knowledge and expertise in air traffic management into the future air traffic management system. This turnaround of business prospects is a positive reflection on the collective knowledge, skill, and resilience of the Volpe Center's TFM team. *(Sponsored by FAA)*

Transition to Reduced Vertical Separation Minima Completed

The Volpe Center's Enhanced Traffic Management System (ETMS) team, on behalf of the FAA, successfully completed transition to the new Reduced Vertical Separation Minima (RVSM). As of January 20, air traffic controllers are allowed to separate properly equipped aircraft by 1,000 feet vertically, rather than the current 2,000 vertical foot restriction. The RVSM applies to flights operating in altitudes between 29,000 and 41,000 feet. FAA reports that this will allow six new flight levels, increasing air traffic capacity and saving airlines more than \$393 million a year in fuel. At the same time RVSM was initialized here, the new program went into effect for Canada, Mexico, the Caribbean, and Latin America that rely on the ETMS, hosted by Volpe. For a jet to be certified as RVSM-compliant, it must have two independent altimetry systems, an automatic altitude callout system, an altitude alert and a Mode 3A transponder, as well as a version 7.0 or later traffic-alert and collision avoidance system. *(Sponsored by FAA)*

Surface Surveillance Information Management

The Volpe Center developed a database and network infrastructure to provide surface surveillance data to airlines and R&D organizations. The surface surveillance data provides critical real-time aircraft status to United Parcel Service (UPS) and Federal Express (FedEx) hub operations at the Louisville and Memphis airports, respectively. For UPS and FedEx, this data is important to efficient scheduling of ground resources and results in minimal turnaround times for cargo aircraft in a very competitive environment. In addition, the live surface data facilitates development of surface traffic management software at Metron Corporation and the FAA Technical Center and traffic flow management (TFM) research at the Volpe Center. For the TFM research, the Volpe Center developed the event extractor tool to identify times of specific surface events important for TFM predictions. The distribution of surface surveillance data to non-FAA users is unique to Louisville and Memphis and the

infrastructure the Volpe Center developed is a model for future implementations. *(Sponsored by FAA)*

Terminal Facilities Replacement Support

The Volpe Center supports the FAA in the areas of program management, schedule management, and systems engineering for the replacement of airport traffic control towers (ATCT) and terminal radar approach control (TRACON) facilities. The FAA's Terminal Facilities Sector is responsible for the establishment, replacement, and modernization of terminal air traffic control facilities to ensure cost effective infrastructure platforms exist for the control of air traffic in the National Airspace System. In FY 2005, the Volpe Center supported the Terminal Facilities Sector in: the establishment of a new ATCT/TRACON at the Phoenix Sky Harbor International Airport; the collocation of the Houston TRACON into the Houston Air Route Traffic Control Center; the initial planning for the Fort Sill Army Radar Control Center/Oklahoma City TRACON transition project; and the development of life cycle cost estimates for congressionally mandated ATCT and TRACON replacement projects. *(Sponsored by FAA)*

Telecommunications Information Management System

The Volpe Center continues to support the FAA's Telecommunications Information Management System (TIMS). The Volpe Center is responsible for the design, development, operation, maintenance, and user training of TIMS. TIMS provides a single, central, national data repository of FAA telecommunications ordering, funding, and inventory information along with a consistent set of automated tools to support the telecommunications business processes of the FAA. In FY 2005, the Volpe Center delivered TIMS software upgrades in two primary areas: automated disconnect processes for telecommunications services being transitioned to the FAA's Telecommunications Infrastructure (FTI) contract; and new functionality to handle the FAA's management of FAA-owned telecommunications assets. *(Sponsored by FAA)*

Next Generation Air Transportation System

The Volpe Center is continuing its support to the NASA Aeronautics Research Mission Directorate through active participation in the Small Aircraft Transportation Systems (SATS) Program, the Next Generation Air Transportation System (NGATS)/Joint Program Development Office (JPDO) and through membership in the Aeronautics, Science and

Technology Subcommittee of the National Science and Technology Council (NSTC). The Volpe Center serves as a member of the SATS Advisory Board and both as a consultant to the NGATS/JPDO Board and a member of the NGATS Agile Air Traffic Integrated Product Team. As a member of the NSTC Aeronautics Science and Technology Subcommittee, the Volpe Center also serves as a member of the Civil Aeronautics Research and Development Policy Working Group. The Volpe Center is a key contributor to the JPDO Futures Working Group and participating in a major initiative related to the human automation interface and its implications for the next generation air traffic system. *(Sponsored by NASA)*

Engineering and Turnkey Deployment Capability on Behalf of U.S. Air Force (USAF)

In FY 2005, the Volpe Center, on behalf of the USAF, Electronic Systems Center (ESC), National Airspace System (NAS) Program Office, continued its support to a long-term project to replace DoD's terminal radars, voice switching systems, and terminal automation systems, including the Digital Airport Surveillance Radar (DASR); Voice Communications Switching System/Enhanced Terminal Voice Switching (ETVS) System; and Digital Advanced Automation System (DAAS)/Standard Terminal Automation Replacement Systems (STARS). The Volpe team participates in the deployment of these systems at over two-thirds of the 177 USAF and Air National Guard (ANG) Bases worldwide. For the past six years, Volpe 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. The Volpe Center provides the government's technical oversight, conducting the system acceptance test (SAT) for STARS and ETVS, and participating in SAT for DASR at each location. We have become such an integral part of the team that our responsibilities have grown each year on behalf of the program office. *(Sponsored by USAF)*

Highway Economic Requirements System (HERS) Model Redesign

The Highway Economic Requirements System (HERS) model has been improved from an engineering model to one that is held up as an outstanding example of applied economic analysis, which other agencies should emulate. The Office of Management and Budget and the Office of the Secretary of Transportation have expressed interest in congestion pricing and its potential impacts on justifying highway investment. No

existing model can answer the question of how much capital investment could be reduced by using peak pricing. At the request of the Federal Highway Administration (FHWA), Volpe Center staff are modifying HERS to be able to apply efficient pricing. The Volpe Center is developing algorithms for disaggregating demand into peak, counter-peak, and off-peak periods. The existing elasticity algorithms treat demand as a single "all-day" schedule, not one that fluctuates by time of day. In the course of designing equations to impute demand by period and apply cross-elasticities between periods, the Volpe Center has had to redesign the HERS algorithms that separate daily traffic volumes into demand periods for purposes of estimating delay. This has led to data collection and empirical research by Volpe Center staff on diurnal traffic distribution patterns, in the absence of congestion pricing. The redesigned model will be used for HERS production runs feeding into the 2006 Report to Congress on the Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report. This work is a major redesign of the HERS model, using cutting-edge analysis to address a high profile question with major implications for the Federal budget for transportation. *(Sponsored by FHWA)*

Planning Transportation Programs and Systems for National Parks and Public Lands

More than 276 million visitors traveled to America's national parks in 2004. These visitors, along with those visiting other Federally managed public lands, faced a unique set of transportation challenges. The Volpe Center works with the National Park Service (NPS) and other Federal land management agencies to advance transportation programs, and to design alternative transportation systems, to address these challenges. Through the Federal Lands Highway Program, the Volpe Center has helped to develop the NPS National Transportation Management Program (TMP), which aims to promote sustainable transportation solutions that enable public access to national parks while reducing resource damage, mitigating traffic and parking congestion, and improving visitor enjoyment. A broad range of Volpe Center efforts — technical assistance, strategic communications, outreach and training, financial analysis, planning reviews, and system evaluations — has proven useful to both TMP and the NPS Park Roads and Parkways Program. The Volpe Center has also undertaken some 40 individual transportation-planning projects at the park level, ranging from water transportation studies to light-rail design alternatives. *(Sponsored by NPS, FHWA)*

Managing Transportation and Land Use Conflicts in Southeast Baltimore

Rapid development in the waterfront area of southeast Baltimore threatens to overwhelm the transportation infrastructure. This has created a conflict between the policy objectives of urban revitalization and high quality life. As a result, the Baltimore City Department of Transportation (BCDOT), seeking national expertise and a neutral third party, asked the Volpe Center for assistance in understanding and analyzing the key transportation and land use issues and developing recommendations for resolving these issues. The Center gathered input from neighborhood associations, businesses and developers, researched other cities' experiences, collected traffic data and customized a regional travel demand model in order to produce a coherent set of recommendations and implementation advice for BCDOT. The recommendations, if implemented, will help relieve bottlenecks, increase parking availability, improve transit, support non-motorized transportation and pedestrian-oriented streets, and strengthen data collection, interagency coordination, and decision-making. Implementing these recommendations will break new ground for Baltimore not only by increasing

roadway capacity and decreasing demand for single-occupancy cars, but also by rethinking the way municipal departments work together. Baltimore can also serve as a model for other cities looking to manage land use and transportation jointly.

(Sponsored by the Baltimore City DOT)

Improved Disability Access on Passenger Vessels

In January 2005, the Volpe Center completed a new risk-based methodology for providing improved wheelchair access through watertight doors on passenger vessels, in support of the Architectural and Transportation Barriers Compliance Board (ATBCB). The project first examined the conflict between ATBCB access guidelines and the Coast Guard's watertight integrity regulation for watertight doors and sills, whose purpose is to prevent the entry and downflooding of water into the vessel. The new approach enables a barrier-free pathway by reconfiguring doors and structures so as to mitigate the water ingress and downflooding hazard, and will assist designers, operators, and safety inspectors in improving disability access on the vast majority of U.S. passenger vessels. *(Sponsored by the U.S. Architectural and Transportation Barriers Compliance Board)*

Global Connectivity

Facilitate a more efficient domestic and global transportation system that enables economic growth and development

FAA International Site Assessment and Security Certification

In order to comply with the requirements of the Federal Information Security Management Act (FISMA), the FAA's International Program Management staff requested support from the Volpe Center in its effort to provide a secure Local Area Network (LAN) environment in their Brussels, Belgium office. The Brussels LAN supports FAA data from disparate locations in Europe and the United States and must go through a successful Certification and Accreditation (C&A) process in order to be deemed secure. The Volpe Center effort led to securing the Brussels LAN, documenting the level of security the LAN operates with, and providing the required documentation to the FAA Information System Security Officer (ISSO) that led to the successful completion of a C&A and to the operational status of the Brussels site. *(Sponsored by FAA)*

Support to United States Air Force Air Mobility Command (USAF AMC) and United Kingdom Ministry of Defence (U.K. MOD)

During FY 2005 the Volpe Center facilitated transportation technology sharing transfer between the U.S. DOT (FAA), USAF AMC, and the U.K. MOD; enabled In-Transit Visibility for a friendly allied partner, the U.K. Defence Transport and Movement Agency (DTMA); and provided clear guidance, based on sound risk, cost benefit and business analysis on how to move forward with appropriate technology to support the transportation enterprise for both the USAF AMC and the U.K. DTMA. The Volpe Center team's efforts enabled existing sys-

tems to effectively share information and to present this in an easy to use, graphical, and web based format, essentially making the whole greater than the sum of its parts. This technology has been used to great effect by Volpe customers both in the United States and the United Kingdom. For example, the Volpe Center developed products enables the DTMA to make key information visible online using web-based and brokered technology in real time. This includes visibility of airlift, cargo, personnel, and easy access to a great deal of other information (such as biosecurity policy). *(Sponsored by USAF AMC and U.K. MOD)*

Iraqi Railroad System

The Volpe Center was instrumental in supporting the Iraqi Rehabilitation Management Organization (IRMO), formally known as the Coalition Provisional Authority, by overall program management support for supplying key railroad maintenance and construction equipment for the Iraqi Railways system. This work included contracting, manufacturing oversight, handling delivery logistics, and finally accepting the equipment and training Iraqi Railways personnel on railroad construction equipment. A total of thirty-eight machines, representing six different types of equipment, were manufactured in the United States, Italy and Russia, and are now being used to rebuild the Iraqi Railways System. *(Sponsored by the IRMO)*

Safe Skies for Africa Initiative

This year, on behalf of the FAA, the Volpe Center participated in an International Civil Aviation Organization (ICAO) Communications, Navigation, and Surveillance/Air Traffic

Management (CNS/ATM) meeting in Abuja, Nigeria. The Center discussed implementation of a Global Positioning System (GPS) Notice to Airmen (NOTAM) system to support flight planning and provide training of a GPS outage prediction tool developed by the Volpe Center that supports generation of aeronautical information. Aviation representatives from each country in Africa participated. One of the goals of this initiative is to encourage the expeditious implementation of the use of GPS to improve air navigation safety. *(Sponsored by FAA)*

U.S.-French Vehicle Track Interaction Research

The Volpe Center has been supporting the FRA in the area of Vehicle Track Interaction for more than 25 years. The results of this work are critical in determining the critical size of geometric irregularities in track. For the past five years the FRA and the Volpe Center have been working with a group of French researchers to better understand the differences between U.S. and French standards for high-speed track. In the past year, significant conclusions were reached about the nature of these limiting irregularities and some of the underlying safety criteria used to evaluate the vehicle response. Important in these investigations has been the evaluation of high-speed curving especially at high levels of cant deficiency. This work is closely coupled with an effort to develop the next generation vehicle track inter-

action simulation tool. The FRA is funding the University of Illinois to develop this tool and the Volpe Center has been providing critical detailed reviews of the code and established benchmark criteria to evaluate the performance. *(Sponsored by FRA)*

U.K. Rail Safety and Standards Board (RSSB)

In the spring of 2005, the Volpe Center and FRA officials, completed the first annual project review meeting with the United Kingdom's Rail Safety and Standards Board (RSSB). The meeting was held in London, England and provided a venue for discussions on all areas of rail research covered under the Memorandum of Understanding (MOU) between FRA and the RSSB. The meeting addressed opportunities for information sharing and collaborative research activities related to rail equipment integrity (passenger and freight), track and infrastructure research, and level crossings. The RSSB is considering the use of traffic channelization devices to reduce driver violations at crossings. The FRA/Volpe Center staff are moving ahead with previous agreements on collaborative efforts to improve occupant protection via various testing in the United States and United Kingdom, and modifications to interior structures. *(Sponsored by the FRA and U.K. RSSB)*

Environmental Stewardship

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

System for Assessing Global Emissions (SAGE)

FAA's SAGE, designed and developed by the Volpe Center, is a new computer model used for predicting fuel burn and emissions for the entire world's commercial aircraft — over 30 million flights annually. In 2004, FAA's Research and Development Advisory Committee identified the model as the most significant environmental development project underway by FAA. The previous year, the American Institute of Aeronautics and Astronautics identified SAGE as one of the most notable ongoing FAA research efforts. As SAGE is the only non-proprietary model of its type, it drove the United States position at recent meetings of the International Civil Aviation Authority's Committee on Aviation and Environmental Protection (ICAO/CAEP). It is currently undergoing ICAO/CAEP review for formal adoption. In addition, FAA is currently working with the Environmental Protection Agency to utilize SAGE as the tool for providing U.S. aviation fuel usage figures to the United Nation's Framework Convention on Climate Change (UNFCCC). UNFCCC, with an open offer from FAA, is considering making SAGE results available to all U.N. member nations required to submit fuel burn data to the UNFCCC. This groundbreaking model will also provide the foundation for continued U.S. research in global warming, an area of specific note in the DOT Strategic Plan. *(Sponsored by FAA)*

Airport Noise Mitigation

From 1982 to 1999, \$4.3 billion has been spent on noise mitigation activities at United States airports, and the Volpe-

developed Integrated Noise Model (INM) — a computer model for airport noise prediction and analysis — is the primary tool used by decision makers charged with these expenditures. In September 2005, the FAA released Version 6.2 of the INM. A specific focus of Version 6.2 was to support more complete modeling of air tour noise in the National Parks. This version of the model will directly support the FAA and the National Park Service in the development of Air Tour Management Plans (ATMPs), as part of a separate Volpe Center project for the Western Pacific Region of the FAA. Version 6.2 also reflects the initial results of a multi-year, Volpe-led effort to develop and implement in INM a new International Standard for the lateral attenuation of aircraft sound, which was recently adopted by the Society of Automotive Engineers. *(Sponsored by FAA)*

Highway Noise Mitigation

Since 1970, over \$2 billion has been spent on highway noise barrier construction in the United States. The FHWA's Traffic Noise Model (TNM) — a computer model developed by the Volpe Center to predict highway traffic noise levels — is the primary tool used by decision makers charged with these expenditures. Originally released by FHWA with Volpe Center support in 1998, the latest Version 2.5 was released by FHWA/Volpe in 2004. It reflects substantial improvements to the core acoustics and has undergone comprehensive field validation. In May 2005, FHWA announced in the Federal Register that Version 2.5 would be the official model to be used for all future traffic noise analyses. It is expected that Version 2.5 enhancements will lead to more accurate highway noise barrier design, and consequent-

ly a more accountable allocation of highway construction dollars. FHWA has conservatively estimated that the use of TNM will result in an annual cost savings of \$20 million annually as a result of its improved accuracy. *(Sponsored by FHWA)*

Analytical Support for Corporate Average Fuel Economy Standards

On August 23, 2005, Secretary Mineta announced a proposal to reshape the regulations governing the Corporate Average Fuel Economy (CAFE) of light trucks. This represents the biggest change to the CAFE program since its inception in the late 1970s, when minivans didn't exist and pickup trucks were used almost exclusively as work vehicles. Today, minivans, sport-utility vehicles, and pickup trucks used by households account for half of all light vehicle sales in the United States. In reforming the standards applicable to light trucks, NHTSA sought to balance concerns regarding jobs, safety, economic competitiveness, and the need to conserve energy. The proposed reform shifts from a single-value standard (e.g., 22.2 miles per gallon) to the sales-weighted harmonic average of six fuel economy "targets" that vary with vehicle size. The Volpe Center supported NHTSA's development of this proposal by integrating detailed product plans provided by manufacturers, reviewing available technologies, and developing and utilizing a modeling system that estimates the costs and benefits of different options. The system, which required more than a year to develop, involves 500 pages of source code, considers two dozen available technologies, and operates on as many as a thousand unique vehicle models in any given model year. Volpe Center staff made extensive use of the system to provide NHTSA with analysis needed for decisions regarding the structure and stringency of the reformed CAFE system. The Center's work provides most of the proposal's analytical underpinnings. *(Sponsored by NHTSA)*

Hybrid-Electric Locomotives

The Volpe Center procured and delivered to the U.S. Army three hybrid-electric locomotives. Known in the industry as "Green Goats" these locomotives can provide savings in fuel usage and lowered green house gas emissions from 40-60 percent when compared to conventional diesel engine switcher locomotives with the same starting equivalent horsepower. Fort Hood in Texas and Fort Irwin and the Sierra Army Depot in California were the first three U.S. Army locations to acquire this new technology. Because of the success of this effort, the Volpe Center recently signed into contract an additional hybrid locomotive for the U.S. Army. *(Sponsored by the DoD/U.S. Army)*

National Environmental Site Cleanup Report

The Volpe Center developed the "Environmental Site Cleanup Report" (ESCR) for the FAA ATO-W, documenting the status of approximately \$500 million in identified environmental cleanup requirements associated with over 50,000 FAA facilities. These contaminated sites are primarily the result of past hazardous waste management activities (e.g., improper waste disposal) or hazardous material spills (e.g., fuel storage tanks, PCB transformers) from FAA and other potentially responsible parties. This work is critical to the planning and budgeting of cleanup activities, and for FAA to ensure operationally suitable FAA workplaces fully compliant with all occupational safety and health procedures and practices. *(Sponsored by FAA)*

Commercial Air Tour Management Plans for National Park Overflights

The Volpe Center supports the FAA, Western Pacific Region, Executive Resource Office, in the implementation of the Air Tour Management Plan (ATMP) Program as directed by Congress in the National Park Overflights Act of 2000. The objective of the program is to regulate commercial air tours over units of the National Park System, such that significant adverse impacts on natural and cultural resources and visitor experiences are prevented or mitigated. Over 130 National Park units are subject to the law, with an estimated cost of \$65 million to prepare the ATMPs. The Volpe Center is undertaking the acoustic and ecological field studies and subsequent analyses to develop Environmental Assessments or Environmental Impact Statements required for the ATMPs that are unique to each park. This work is providing for improved stewardship of the natural and cultural resources of the United States. *(Sponsored by FAA)*

EPA's Cleanup at Superfund Site, Libby, Montana

The Volpe Center has provided technical and project management assistance to the Environmental Protection Agency (EPA) analyzing and assessing ongoing asbestos exposure in Libby, Montana since 1999. The Center has performed environmental analyses and assessments at over 3,500 locations in the Libby area, identifying over 1,200 sites requiring cleanup. The City of Libby, Montana is a Superfund National Priorities List site. The Volpe Center has developed and implemented a site-specific Comprehensive Safety and Health Program; sampling and analysis program; relational database of sample, laboratory analysis, survey, and geolocation information; and site-specific processes for inspection, design, cleanup, disposal, and over-

sight. Over 375 properties to date, including residential, commercial, and recreational facilities, have been remediated by the Volpe Center's contractors. *(Sponsored by EPA)*

Ballast Water and Aquatic Nuisance Species Management

The Volpe Center manages several important elements of the U.S. Coast Guard's aquatic nuisance species (ANS) program, which aims to stem the flow of invasive species into U.S. coastal waters from ballast water discharged from ships. A technical

review panel of engineers and biologists conducts assessments of experimental onboard treatment systems for the Coast Guard Shipboard Technology Evaluation Program (STEP), including engineering plans and biological treatment effectiveness, through desktop reviews and onboard observations of system tests. The Panel also completed a technology assessment of thirteen ballast water treatment systems in this emerging field, to assist Coast Guard policy makers as they consider new U.S. and international ballast water management regulations. *(Sponsored by the DHS, U.S. Coast Guard)*

Security

Balance homeland and national security transportation requirements with the mobility needs of the Nation for personal travel and commerce

Integrated Security Systems Deployment

The Volpe Center has assisted several Federal, state and local agencies to design and implement integrated security systems to help protect elements of our Nation's transportation system and critical government facilities. The Center initially helped the FAA identify security technologies for airports and air traffic control facilities. The Volpe Center staff refined their expertise by supporting the implementation of state-of-the-art security systems for the U.S. Departments of State and Treasury and the U.S. Capitol Police (USCP) at their landmark facilities in Washington, D.C.

This year, the Volpe Center advanced the use of integrated security systems on public transit systems. The Volpe Center developed a set of "Transit Security Design Considerations" for the FTA, which has been distributed nationally to transit authorities. This document recommended a systems approach to implementing security technologies, and will potentially impact millions of dollars of capital investments at transit systems.

The Volpe Center also assisted the Massachusetts Bay Transportation Authority (MBTA) to implement an integrated security system on the new Silver Line Bus Rapid Transit System tunnel in Boston. The system was implemented this year, and has already produced both security and operational benefits. The Volpe Center is now supporting the MBTA to expand the Silver Line design throughout the 81 stations in the transit system. Under FTA sponsorship, the Volpe Center is producing a case study of the integrated security systems deployed on the MBTA Silver Line for national dissemination. The integrated

security system approach that the Volpe Center has developed has the potential to produce security, safety, and operational benefits for transportation system operators in all modes. In addition, as a result of this experience, the Volpe Center is well-positioned to assist the Department of Transportation incorporate the latest in integrated security systems in the new DOT headquarters building, and will continue to support implementation of these technologies throughout the national transportation system. (*Sponsored by FAA, FTA, U.S. Department of State, U.S. Department of Treasury, USCP, MBTA*)

Vehicle and Driver Identification and Screening Systems Deployment

The Volpe Center has demonstrated and deployed a variety of technologies that can assist various Federal agencies to efficiently identify and screen drivers and vehicles entering controlled areas. The Volpe Center assisted the U.S. Citizenship and Immigration Services to demonstrate the use of advanced technologies, such as biometrics, for identifying travelers at international borders and airports. These systems were the forerunners of current international initiatives under the U.S. Visit Program, the Free and Secure Trade Program, and others.

The Volpe Center also assisted Federal agencies, such as the U.S. Capitol Police, to design and implement systems to identify drivers and vehicles entering critical government facilities and thereby reduce potential threats posed by unauthorized people or vehicles. The Volpe Center has applied its expertise in driver and vehicle screening technologies to develop the Advanced Vehicle and Driver Identification System (AVIDS) for the

Department of Defense (DoD). Volpe Center staff demonstrated AVIDS at a military base, improving security and reducing wait times significantly. The DoD has commercialized the Volpe Center design for AVIDS, and several private companies are expected to produce commercial products for use at government facilities, airports, seaports, etc. In response to the increased threat of vehicle bombs in locations such as Iraq, the Volpe Center has produced a deployable version of AVIDS. The Volpe Center is providing AVIDS units for rapid deployment overseas to protect U.S. military personnel. AVIDS and the other driver and vehicle screening systems developed and deployed by the Volpe Center are good examples of how innovative technologies can improve security, operational efficiency and throughput at facility entry points and international borders. *(Sponsored by U.S. Citizenship and Immigration Services, DoD, USCP)*

Maritime Domain Awareness Technology Deployment

The Volpe Center has implemented vessel identification and tracking technologies to improve maritime domain awareness in the Panama Canal, St. Lawrence Seaway and Columbia River. These applications have resulted in improved safety and operational efficiency. Most recently, the Volpe Center has assisted the Department of Homeland Security (DHS) and the DoD to apply vessel-tracking technology for security purposes. Under the sponsorship of DoD, the Volpe Center developed the Vessel Identification and Positioning System (VIPS) to help prevent attacks on Navy vessels, such as the attack on the U.S.S. Cole. The Volpe Center demonstrated VIPS in Boston Harbor during the Democratic National Convention and at U.S. Navy facilities in the Mediterranean Sea. The DoD is commercializing the VIPS design, and products based on the Volpe Center design should be available from industry in the near future. Recently, the Volpe Center initiated support to the Coast Guard to implement vessel identification technologies throughout the United States through the Maritime Domain Awareness Program. The Center is also supporting the Navy to deploy these technologies throughout their area of operations in Europe. The technologies implemented by the Volpe Center integrate vessel positioning and mapping data from many sources, thus providing greatly improved situational awareness. Volpe Center sponsors expect these applications to produce benefits in safety, security, and operational efficiency for Federal, state, and local agencies, as well as commercial vessel and facility operators. *(Sponsored by DHS, DoD)*

Vulnerability of the Global Positioning System

The Volpe Center is working on behalf of the FAA to mitigate the vulnerabilities of the Global Positioning System (GPS). There is renewed interest in this topic following the December 2004 release of the "U.S. Space-Based Positioning, Navigation, and Timing (PNT) Policy" Presidential Directive. This directive designated Federally-provided PNT systems as part of the critical infrastructure. The Volpe Center is working with the FAA's Air Traffic Operations Office to demonstrate the value in having Loran-C as a backup system to the GPS that will maintain performance standards in the urban and maritime environments. GPS is particularly vulnerable to disruptions caused by signal blockage while Loran is less vulnerable. The Volpe Center project with the FAA will validate whether the complementary positioning and timing features of Loran-C and GPS meld into a tracking system that benefits a variety of land and water users. *(Sponsored by FAA)*

Screener Training Quality Assurance Monitoring

The Transportation Security Administration's (TSA) Quality Assurance (QA) Branch, Evaluation and Quality Assurance Division, within the Office of Workforce Performance and Training is responsible for monitoring, evaluating, analyzing, and reporting on the effectiveness, efficiency, and adequacy of training programs. The QA Branch manages a National Training QA Program to ensure standardization of training delivery and that course offerings and screener recertifications are achieving their intended objectives. In FY 2005, the Volpe Center provided support to TSA's QA program. Federal staff from the Volpe Center were trained and certified as TSA QA monitors and then deployed throughout the country to observe screener training sessions, to evaluate the delivery and the effectiveness of the training, and to verify that course offerings are being delivered in a standard format consistent with TSA policy. The Volpe Center conducted 28 individual screener training QA site visits. In addition, drawing on the 28 site visits plus stakeholder interviews and an industry benchmarking analysis, the Volpe Center provided TSA with an analysis of the current state of the screener training QA program. *(Sponsored by DHS)*

Healthwatch — Transportation Disease Migration

The Volpe Center is supporting the Centers for Disease Control (CDC) to improve predictions of the spread of disease. The Volpe Center is supporting the Transportation Disease

Migration Project (Phase I) to provide the CDC and the Armed Forces Medical Intelligence Center (AFMIC) with operational prototype software for estimating air passenger movements. In August 2005, the CDC, National Center for Infectious Disease (NCID), Division of Global Migration and Quarantine

(DGMQ), NCID's Office of Informatics, and AFMIC conducted a functional review of Version 1 Prototype software that the Volpe Center developed and have been enthusiastically engaged in identifying enhancements for subsequent prototype versions. *(Sponsored by the CDC)*

Organizational Excellence

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

The Volpe Center's efforts to support the President's Management Agenda (PMA) and achieve organizational excellence goals in the areas of budget and performance integration, e-government, financial performance, competitive sourcing and strategic management of human capital are two fold: 1. initiatives and projects aimed to improve our client's organizations and 2. efforts designed to strengthen the Volpe Center's own organization.

Strategic Management of Human Capital

Foster a citizen-centered, results-based government that is organized to be agile, lean, and capable of making timely decisions.

Helping Build an Effective Transportation Workforce

A key component of DOT's Strategic Plan is the establishment of a strong DOT leadership role in transportation workforce development. The Volpe Center is helping DOT provide this leadership through its capacity building programs, which provide information, technical assistance, tools, and training to transportation professionals. Building on the success of two established Professional Capacity Building (PCB) programs in Intelligent Transportation Systems (ITS) and Transportation Planning, the Center is helping the FHWA build new programs in several areas that are major DOT priorities: roadway safety, environmental stewardship, security and emergency management, and public-private partnerships. The Center is helping FHWA assess needs and available training resources in these

areas, develop multi-year strategic plans, and provide training, outreach materials and other resources to implement the program plans. The Center has also been instrumental in establishing a council that brings together managers of capacity building programs from across the DOT. The PCB Program Management Council helps managers exchange information and effective practices, identify opportunities for enhanced knowledge management, and better integrate training, technical assistance, and information dissemination among programs. *(Sponsored by FHWA)*

Volpe Center is "Green" on Strategic Management of Human Capital Scorecard

The Volpe Center received numerous accolades on its Leadership/Knowledge Management, Performance Culture, Workforce Planning/Talent and Accountability Programs in a U.S. Office of Personnel Management (OPM) Audit Report in February. OPM reviewed the Center's human resources management policies and procedures; interviewed the Volpe Center's Equal Employment Opportunity Officer, Union President and HR staff; and held three group sessions with senior managers, supervisors and employees. OPM concluded that the Volpe Center's Human Capital Program was strategically aligned with the PMA and corporate business goals. OPM also found that the Center made use of the full range of HR flexibilities and set the standard for OPM's further evaluation of DOT's HR programs. The Volpe Center, as part of the DOT/RITA HR community, is "Green" on status and progress for the PMA, Strategic Management of Human Capital scorecard.

Volpe Center's Student Employment Program Model for Department

During the year, the Volpe Center hired a total of 33 Ph.D., graduate and undergraduate students under the Co-op or Student Career Experience Program (SCEP) thus attaining its business plan goal to have approximately 40 students on the rolls at any one time. Fourteen, or 42 percent, of the 33 hires were women and six, or 18 percent, were minorities. The Co-op Program serves as a staffing pipeline for future permanent hires and an excellent tool to meet the Department's goal to increase entry-level hiring. The Center converted eleven Co-op students to permanent or term appointments. Five, or 45 percent, of the eleven conversions were women and one, or 9 percent, is a minority. Despite intense competition with agencies located in Washington, the Center successfully continued its practice of enticing top caliber graduates to join the Center under the Presidential Management Fellows (PMF) Program. The Center hired a female graduate from Columbia University with a Masters in Public Administration (Concentration: Environmental Science and Policy) as a GS-11 PMF Environmental Specialist.

The Volpe Center Strengthens Results Oriented Performance Culture

A Union/Management team developed a four level performance appraisal system that met the President's Management Agenda/DOT requirement for a system to distinguish between levels of satisfactory performance and also integrated the Center's core competency framework. Center management championed the effort to better identify key contributors through expanding the recognition of honorary awardees at the Center's Annual Award Ceremony. In addition, they also instilled a more disciplined approach in addressing poor performance through facilitating redeployment of employees to projects where there were better skill matches, funding on-the-job training and supporting managers in formal performance-based actions.

Volpe Center Marketing Initiative

The Center focused in FY 2005 on improving its business development/marketing processes and practices. A marketing task force proposed a new marketing process, identified roles and responsibilities, and specified needs including marketing training, market research, a customer relationship database, an Intranet-based marketing resource site, and collateral materials

to support marketing efforts. Future strategic and annual plans will reflect these actions.

Client-Sponsored Training User Group

The Client-Sponsored Training User's Group (CTUG) was started in 1992 as an informal, grass roots endeavor to foster excellence in state-of-the-art technology transfer as the Volpe Center community explores the systematic study of transportation and logistics issues, methods, and theories in our projects. CTUG provides a forum for the Volpe Center to discuss the requisite tools and knowledge base that have been, and continue to be, developed in support of the Volpe Center's integrated system approaches to critical intermodal transportation and logistics issues.

The CTUG audience is comprised of staff members from a variety of areas in the Volpe community. CTUG speakers represent academia, Volpe colleagues, other DOT colleagues, and the private sector. This year's CTUG topic areas have included The Democratic National Convention and Its Impacts on Boston's Surface Transportation; Authenticating Passengers While Inside Moving Vehicles Using Biometrics for Entry Point Screening and Border Security; and Lessons Learned for a High Risk Organization — the NASA Space Shuttle.

Lunch Buddies Program

For the seventh consecutive year, Volpe Center community employees volunteered as Lunch Buddies to second and third graders at the nearby Kennedy-Longfellow Elementary School in Cambridge. Lunch Buddies, an all-volunteer program, promotes the Kennedy-Longfellow's commitment to early literacy. In 2004/2005, every one of the 56 Kennedy-Longfellow second and third graders was paired with his or her personal Volpe Lunch Buddy. Throughout the school year, Volpe volunteers read to their buddies every other week for 30 minutes. As described by one of the participating teachers, "The benefits of the program are the individualized attention each child receives and the ensuing conversations about books." Through Lunch Buddies, Volpe is "making a difference" as a good community neighbor — specifically to the students of the Cambridge public school system. As in previous years, in 2004/2005, Volpe received a Certificate of Appreciation from Cambridge School Volunteers, Inc., recognizing the Center for volunteering "in educational programs that provide individualized academic services to students in the Cambridge Public Schools." With 72 permanent and substitute Lunch

Buddy volunteers in 2004/2005, the Volpe Center represented the “largest number of volunteers” from any local corporation, public sector/government agency, or university to volunteer in the Cambridge public schools. Further, since Lunch Buddies’ inception in 1998, 255 Volpe Federal, tenant, and contractor employees have volunteered as buddies!

Competitive Sourcing

Ensure that we are providing the highest quality and the most economical service to Americans.

Design of the Most Efficient Organization

In support of the PMA’s competitive sourcing goal, the Volpe Center conducted a streamlined study of its secretarial and administrative analysis support. In a ninety-day period (stipulated by OMB for streamlined studies), the MEO team, led by Management Systems, produced an agency tender that offered work process improvements, efficiencies, and cost savings. Even though the MEO was comprised of nine fewer positions than in the past, the Center was able to accommodate, without a reduction in force, all impacted parties at their current grade levels. Part of the MEO solution, the consolidation of senior secretary duties with some analytical functions into a new position, even resulted in some competitive promotions for some impacted staff. Over a five-year period of performance, the MEO proposal represents savings of 53 percent when compared to the market analysis or \$7.1 million. The MEO Design Team was collaborative (impacted parties and union representation, sensitive (bi-weekly updates, briefings, and organizational change and career development planning sessions were provided to impacted parties) and effective. The MEO won!

Implementation of the Most Efficient Organization

Once the MEO win was announced, the Volpe Center formed a Transition Team to craft an Implementation Plan to address HR, business process, and performance issues related to the MEO. The MEO Transition Team, consisted of impacted parties, management, union representation and all levels of secretary support. This Team produced its Implementation Plan in 60 days, as planned, to provide for approximately three months to transition to the MEO. The Volpe Center officially stood up the MEO on July 1, 2005, in accordance with the letter of obligation. The Center simultaneously focused on reassignments, an offsite teambuilding training session, and filling vacancies. Through a working group, the Center tested and finalized an

electronic time and attendance pilot application, trained nearly 400 Volpe Center employees, rolled out the application for Center-wide use for the first pay period in July, and established a related Intranet sub-site. While the MEO was stood up as required, there is still much work to do and a core group continues to meet to address implementation issues and concerns.

Budget and Performance Integration

Implement regular, systematic measurement, and accountability for program performance.

Led Development of the RITA Report to Congress leading to improvements in planning and coordination of RD&T across the Department

The Norman Y. Mineta Research and Special Programs Improvement Act requires that the RITA Administrator submit a Report to Congress on DOT’s current and projected RD&T priorities. Volpe Center staff led the development, design, and drafting of the report and submitted it to headquarters ahead of schedule. The report defined, for the first time, the new agency’s vision, mission, and strategic goals. Development of the report required the involvement of many high-level stakeholders. Volpe staff developed the report in close cooperation with the operating administrations and the Office of the Secretary and incorporated feedback from DOT and external stakeholders. As a consequence, the report has been well received by senior leadership in the Department. The buy-in by the operating administrations that resulted from involvement in the report development has led to improved planning and coordination of RD&T across the Department. In particular, it has furthered the implementation of a DOT-wide planning process. This includes a department-wide planning process for research and two bodies for interdepartmental coordination, RITA’s coordination of the Department’s RD&T budget process, the annual review of modal research programs by a cross-Departmental team, and the establishment of a cross modal process for preparing the multi-year strategic RD&T plan required by the recently enacted SAFETEA-LU. (*Sponsored by RITA*)

Support to the U.S DOT Small Business and Innovative Research (SBIR) Program

The Volpe Center manages and coordinates the DOT SBIR Program. It encourages the small business community to participate in developing creative capabilities that address high-priority requirements of the DOT. This stimulates technological innova-

tions which help create new products/services and jobs for the Nation. This is done through the annual SBIR solicitation that sets forth topics that address a wide area of agency specific concerns. The 2005 annual solicitation received sixty-six proposals addressing the eight research topics from twenty-three states and one U.S. territory, Puerto Rico. In addition to the formal program, the Center provides additional support to the small business community by referrals to other DOT procurement opportunities, the TRB Innovations Deserving Exploratory Analysis (IDEA) Program, other agency SBIR programs, and SBA resources. Through these efforts, the Volpe Center has helped make the SBIR program a truly national program that reaches all 50 states. *(Sponsored by U.S. DOT/Office of Small and Disadvantaged Business Utilization)*

Exceeding FY 2005 Major Procurement Preference Program Goals for Awards to Small, 8(a), Small Disadvantaged, Woman-Owned, and HUBZone Small Businesses

The Volpe Center is committed to fostering small business participation in all of its procurements, to actively participate in the Small Business Administration's programs such as the 8(a) Program, and to work with the small business community on new and innovative research and development efforts. In FY 2004, the Center failed to meet its Major Procurement Preference Program goals in the small business and 8(a) goal categories. In FY 2005, the Center embarked on an aggressive plan to meet or exceed these goal categories and exceeded every goal related to Small, 8(a), Small Disadvantaged, Woman-Owned, and HUBZone Small Businesses and increased total small business award achievements by 14 percent.

Project Management Policies, Practices and Support

The Volpe Center implemented a new Volpe Center policy requiring the use of Project Management Standard Practices for Volpe Center Projects and generated five basic Project Management Standard Practices that are required for all projects. A goal is assurance that all projects are managed in a consistent and business-like manner. The Center also developed a plan to certify project managers in accordance with Project Management Institute standards.

Enhancing the Competitive Environment for Transportation Information Project Support Services (TRIPS).

In order to enhance the competitive environment for the

Transportation Information Project Support Services (TRIPS), the follow-on acquisition to the Volpe Center's on-site Technical Support Services contract, the Volpe Center established an acquisition approach that provides for greater flexibility to support our project needs, utilizes performance-based contracting methods, and fosters competition. The Center has encouraged vigorous competition for this follow-on acquisition through the issuance of a Request for Industry Comments in November 2004, issuance of a Draft Request for Proposal in March 2005, and by conducting an extensive pre-proposal conference. This follow-on acquisition will replace the Center's largest contract, and has high visibility within the Department, particularly from the Department's Chief Information Officer.

Transportation Research, Analysis and Communications (TRACX) Contract

The Volpe Center shepherded the transition of the on-site TRACX contract awarded to Chenega Advanced Solutions and Engineering (CASE, LLC) on September 9, 2004, with a full performance start date of November 1, 2004. The contract, effective November 1, 2004, is a four-year task order contract. This contract was a unique procurement and posed unprecedented challenges for the acquisition and transition teams. The acquisition was a sole source award to an Alaskan Native 8-A firm and was comprised of services previously delivered by a combination of the Integrated Communications and Information Services (ICIS) contract with Planners Collaborative, Inc. and the Operations Research and Analysis (ORA) Contract Line Item Number (CLIN) of the Technical Support Services Contract (TSS) with Computer Sciences Corporation (subcontract with EG&G Technical Services, Inc.). This activity helped the Volpe Center to meet the DOT's goals for doing business with small businesses and for moving to performance-based contracting.

Providing Best Value Acquisition Support to the Volpe Center and the DOT

The Volpe Center's Acquisition Management Division is responsible for conducting all procurement activities in support of the mission, goals, and objectives of the Volpe Center, and for providing clients with best value acquisition support. When current projections in direct contract obligations decreased substantially, steps were immediately taken to reduce the Division's expenses and also increase the Center's direct contract obligations for FY 2005 with the support of the Office Directors and Division Chiefs. These efforts resulted in a \$300,000 reduction

in expenses, and processing of over \$22 million in contract obligations during the last two months of the fiscal year. By taking these steps, the Acquisition Management Division provided true “best value” to the Center and its sponsors.

E-government

Through the better use of information technology, enable faster, easier, and more efficient ways for citizens to transact their business with U.S. DOT and provide input on policies and programs.

Simplifying Environmental Permits for Pipelines

As part of its environmental streamlining and stewardship work, the Volpe Center recently initiated an innovative project with the PHMSA’s Office of Pipeline Safety to develop a pipeline repair permit management system. Volpe is working with PHMSA and ten other Federal resource agencies to create a prototype system that will simplify and expedite the environmental permitting process for pipeline repairs. The system provides pipeline operators with one-stop shopping for repairs, by sending the permit application to all the Federal agencies involved at the same time. This system encourages the various agencies tasked with protecting endangered species, streams and wetlands, and protecting against soil erosion and sediment to address permits concurrently, which should significantly increase the speed of permit processing. As the Associate Director for Transportation and Energy of the White House Council on Environmental Quality has noted, the system of coordinated permitting for pipeline repairs has the potential to change the way the government does permitting not only for pipelines, but also for other types of projects, such as highway construction. By promoting enhanced interagency coordination and cooperation, the work furthers DOT’s Organizational Excellence goal as well as its Environmental Stewardship goal. *(Sponsored by PHMSA)*

Operation, Maintenance and Enhancement of FedSTAR

In FY 2005, the Volpe Center, on behalf of the Pipeline and Hazardous Materials Safety Administration’s Office of Pipeline Safety (PHMSA/OPS), continued to operate, maintain, and enhance FedSTAR, plus provide Help Desk and training support to ensure that state compliance is met in a timely manner. The agency’s state partners view FedSTAR as a one-stop information resource for their pipeline grant needs — the One Call pro-

gram, Telephonics Accident Data, and Regulations & Standards information. The Volpe Center’s support has decreased the time for processing state requests for grant reimbursement; streamlined the process used to score the applications and has decreased the wait-time for a state to receive its score and potential funding level for the year. It has also greatly increased state pipeline inspector access to critical standards information, which in the past was severely limited and not current. The FedSTAR system collects data from authorized Federal and state Pipeline Safety Partner programs, uses special business rules to model the data and reporting requirements set out in 49 U.S.C. Chapter 601 for distributed pipeline safety grant monies; and aggregates and analyzes the data to produce customized OPS forms and performance scores, which are fed into special equations to generate financial and other decision-based reports. Imbedded workflow automation in FedSTAR extends into PHMSA’s State Program processes with the management of the payments, performance score processing, document storage and historical data — all which directly relate to the grant process. *(Sponsored by PHMSA)*

Transition of Hazardous Material Information System

During FY 2005, the Volpe Center completed the transition of the Office of Hazardous Materials Safety’s (OHMS) Hazardous Material Information System (HMIS) from a fifteen-plus year old legacy system to a new information technology platform that integrates e-government concepts in mission performance, expanding the use of information technology to enable faster, simpler and more efficient ways for stakeholders to transact business with DOT. The HMIS system also supports the Secretary of Transportation’s Organizational Excellence Goal of enhancing public health and safety by working toward the elimination of transportation-related deaths and injuries. HMIS data and software applications are used to identify emerging safety problems, monitor compliance efforts, support training programs, and supply analytical justification for regulatory proposals, supporting DOT safety objectives. *(Sponsored by PHMSA)*

New Enterprise Resource Planning System

During FY 2005, the Volpe Center played a core leadership role to support specific acquisition activities associated with the FAA’s Air Traffic Organization Service Management Office (ATO-W) efforts to execute a complex acquisition process to acquire both the services of a system integrator and a commercial-off-the-shelf Enterprise Resource Planning (ERP) system to replace multiple legacy systems and modernize FAA asset man-

agement business operations to improve business effectiveness. Volpe Center staff provided technical and process guidance, served on various evaluation teams including the risk mitigation team, and participated in the final Source Selection Official presentation and decision-making process. This effort highlighted the Volpe Center's ability to be part of a broad-based government/industry team and serve as an honest broker focused on what is best for the customer. *(Sponsored by FAA)*

Support to Volpe Initiatives through the Intranet

The Center developed and implemented an Intranet-based document forms system that reduced costs, improved usability, and assured appropriateness for government use. The Center identified and analyzed potential options and selected a solution that would serve users' needs and cost only \$265! The Intranet was used extensively to release the new system and provide continuing support. All available forms are now posted on the Intranet, as are the instructions and files needed to use the software. There is also a feedback mechanism so that users can ask questions or make suggestions to improve the system. Also, the Administrative Handbook, a useful guide for secretaries, was completely revised and posted on the Intranet. Furthermore, the Intranet was used as a tool in the rollout of the MEO-mandated electronic time and attendance (ETA) application. An ETA subsite was designed and posted so that the Volpe community could learn about the new application and how to use it. Frequently Asked Questions and a feedback mechanism were also incorporated into the site for ease of use.

Productivity Improvements

During FY 2005, the Center invested in facility and IT improvements to promote operating efficiencies (e.g., in energy saving technology, improved space use, and common IT operating environment), employee safety (fire alarm, evacuation training), model security technology and processing (for occupants and for business generating demonstration), and identified practical cuts in FY 2006

contractor support services to free up more than \$1.5 million for business development, strategic planning, and other initiatives.

Successful Implementation of New Federal Personnel and Payroll System (FPPS) and e-Learning Management System (LMS)

Due to comprehensive planning and exemplary execution, the Center's transition to these systems was seamless. Center business operations and critical interfaces and data feeds to institutional systems were not interrupted. The Center's cross-functional team approach and its continuous interaction with Departmental staff were critical factors to this successful migration. Additional best practices were continuous communication and outreach to the Union and employees, hands-on training of local users, and beta and parallel testing of security, desktop, and printing configurations.

Financial Performance

Accurately accounting for the taxpayers' money and giving managers timely accurate program cost information to inform management decisions and control costs.

New Financial Data Mart Released

The Financial Data Mart (FDM) of the Volpe Center's Integrated Enterprise Capability (IEC) Data Warehouse was officially released to the entire Volpe community on October 1, 2005. The FDM provides access to consistent, appropriately maintained, and officially accepted project-related financial data. The FDM provides the ability to perform the analyses required to answer typical financial project management questions. It provides access to the types of project-related financial data and to greater levels of detail than previously available from legacy systems. FDM allows for greater flexibility in accommodating diverse informational requirements for project-related financial data.

The Volpe Center Thanks Our Fiscal Year 2005 Clients

U.S. Department of Transportation (DOT)

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 Administration
Research and Innovative Technology Administration
Saint Lawrence Seaway Development Corporation

Other Federal

Architectural and Transportation Barriers Compliance Board
Department of Defense
 U.S. Air Force
 U.S. Army
 U.S. Navy
Department of Energy
Department of Health and Human Services
 Centers for Disease Control and Prevention
Department of Homeland Security
 Transportation Security Administration
 U.S. Citizenship and Immigration Services
U.S. Coast Guard
Department of Labor
Department of the Interior
 National Park Service
Environmental Protection Agency
General Services Administration
National Aeronautics and Space Administration
U.S. Capitol Police
U.S. Postal Service

State and Local

Arizona Department of Transportation
Cape Cod Regional Transit Authority
California Department of Toxic Substance Control
California Department of Transportation
City of Baltimore, Department of Transportation
City of Chicago, Department of Transportation
City of St. George, Utah
Columbia River Pilots
District of Columbia, Department of Transportation
Fairfax County, Virginia
Maine Department of Transportation
Massachusetts Bay Transportation Authority
Massachusetts Port Authority
Washington Department of Transportation

Foreign Entities

Airservices Australia
Iraq Rehabilitation Management Organization
Nav Canada
United Kingdom Ministry of Defence
United Kingdom Rail Safety and Standards Board

Other

The Alliance of Automobile Manufacturers
Alstom Signaling, Inc.
INNOVA Fairfax Hospital (Honda)
Medical College of Wisconsin
The University of Alabama (Mercedes)
Wake Forest University (Toyota)



U.S. Department of Transportation
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