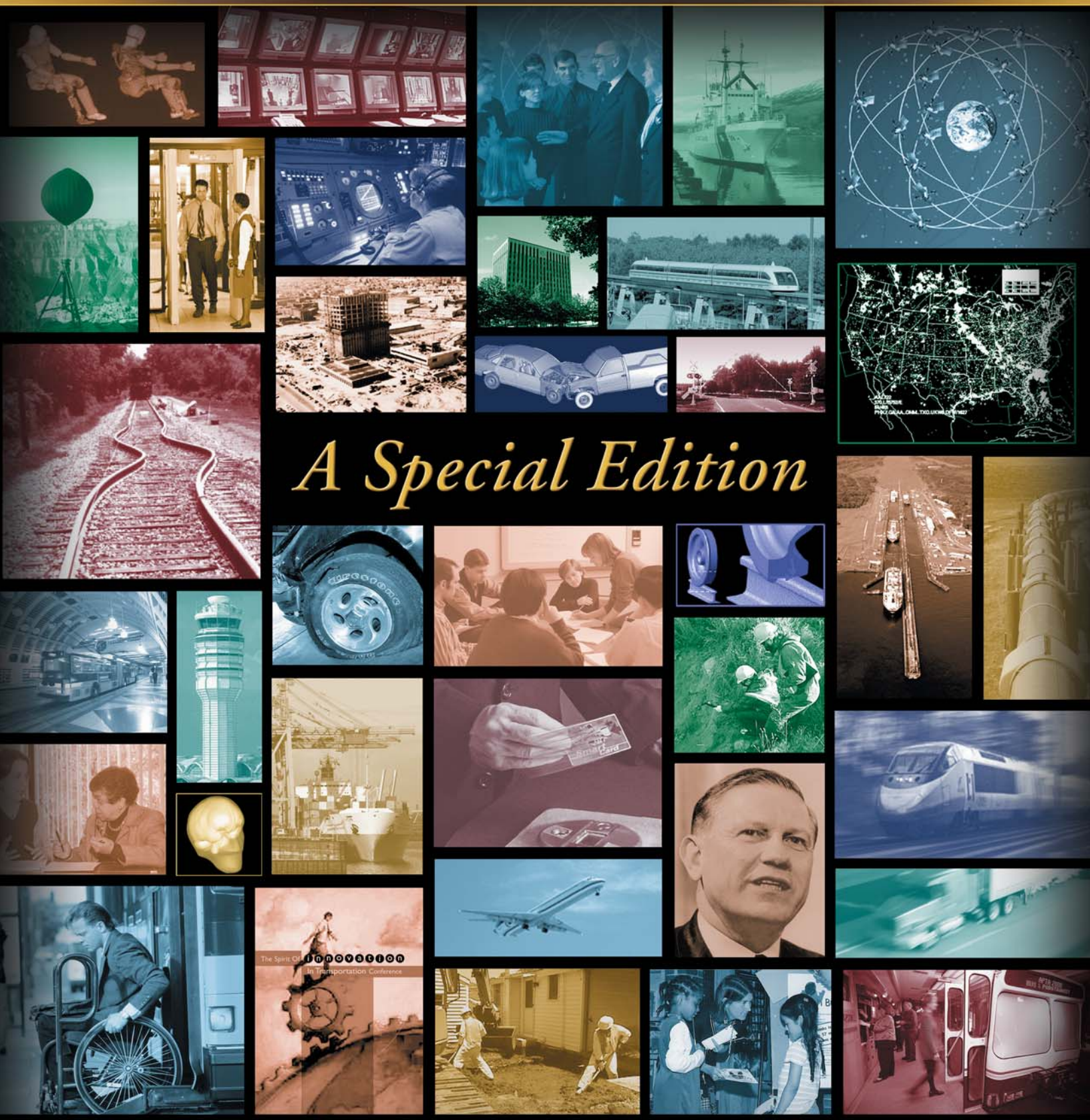
VOLPE JOURNAL

30th Anniversary

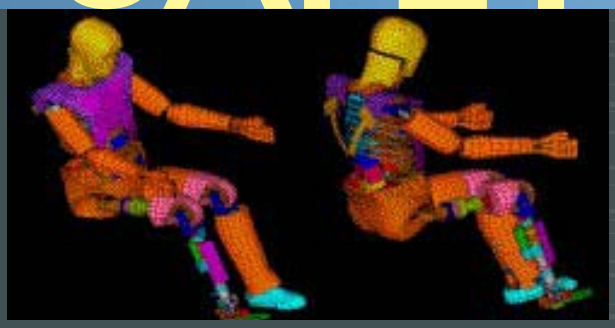


A Special Edition

U.S. Department of Transportation

Research and Special Programs Administration

SAFETY



In 1900, the average American traveled 1,200 miles in an entire lifetime. Today, we each travel 12,000 miles by car alone, in just one year.

Our unprecedented mobility takes us to fascinating places and provides opportunities for work, education, and recreation. But it also puts us at risk for injury and death. One of government's primary roles is to protect its citizens from harm. Keeping the traveling public safe is an ongoing concern—and a key mission of the DOT and the Volpe Center.

Federal transportation safety initiatives have achieved significant results. Since the DOT was created in 1966, accident and fatality rates have decreased substantially. Yet despite improvement on many fronts, potential problems still exist. Changing circumstances can challenge the most sophisticated safety efforts. For example, increased air travel means more planes to manage safely in the air and on the ground. Innovation often poses new problems. High-speed trains promise fast, economical transportation, but their advanced technologies require new approaches to safety.

When we begin any trip, we're confident that we'll arrive safely at our destination. The Volpe Center will continue to devote substantial resources to improving the safety performance of all transportation modes. When it comes to safety, there is no such thing as "good enough."

Working Toward a World Without Accidents

Transportation safety depends on many factors: equipment, infrastructure, materials, engineering, biomechanics, technology, human performance, operations, and regulations. The Volpe Center has been involved with each of these issues, assisting the DOT to enhance safety and helping to save thousands of lives.

The most effective strategy is to prevent accidents from occurring at all. The Volpe Center has been engaged in a variety of accident prevention initiatives. Since many accidents are based on operator error, human factors research examines the interaction of people and machines to develop strategies to optimize safe operator performance. The Center also performs safety and risk assessment analyses of transportation systems. These studies identify safety hazards, accident causes and consequences, and actions that reduce the chance of accidents.

Crash avoidance is a more recent initiative that uses technology to reduce the number of accidents. Satellite-based navigation systems help operators and controllers "see" plane and ship positions under any weather conditions. Positive Train Control and Intelligent Cruise Control use computerized sensors to maintain safe distances between trains and motor vehicles on increasingly crowded tracks and roadways at the same time they maximize capacity.

Unfortunately, not every accident can be prevented, so the Center also works to understand and minimize the effects of accidents. Since the early 1970s, the Center has studied the complex body movements of crash victims. This research began with occupant-motion sensors and instrumented dummies, and today has evolved to computerized crash simulations. This biomechanical research enables the development of safer vehicles.

A Systems Approach Saves More Lives

Many issues influence transportation safety, and all are related. The Volpe Center's systems approach to problem solving examines every possible aspect to ensure that safety risks are fully addressed, and that work in one area doesn't compromise safety in another.

In addition to analyzing a problem, Volpe's systems approach factors in specific safety benefits, user acceptability, and the economic viability of potential corrective actions. Considering the full scope of issues leads to identification of the most effective solutions, because a safety initiative will work only if industry will build it and consumers will use it. This perspective also encourages changes in manufacturing philosophy. Today's planes, trains, boats, and automobiles are designed not only for looks and performance, but for safety as well.

The Volpe Center has established itself as a vital resource for transportation safety expertise. Volpe research has guided the development of regulations, design standards, inspection procedures, maintenance strategies, and safety preparedness plans. The Department of Defense (DoD), National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), and aviation organizations in over 30 countries depend on the Center's guidebook on human factors in air traffic control systems.

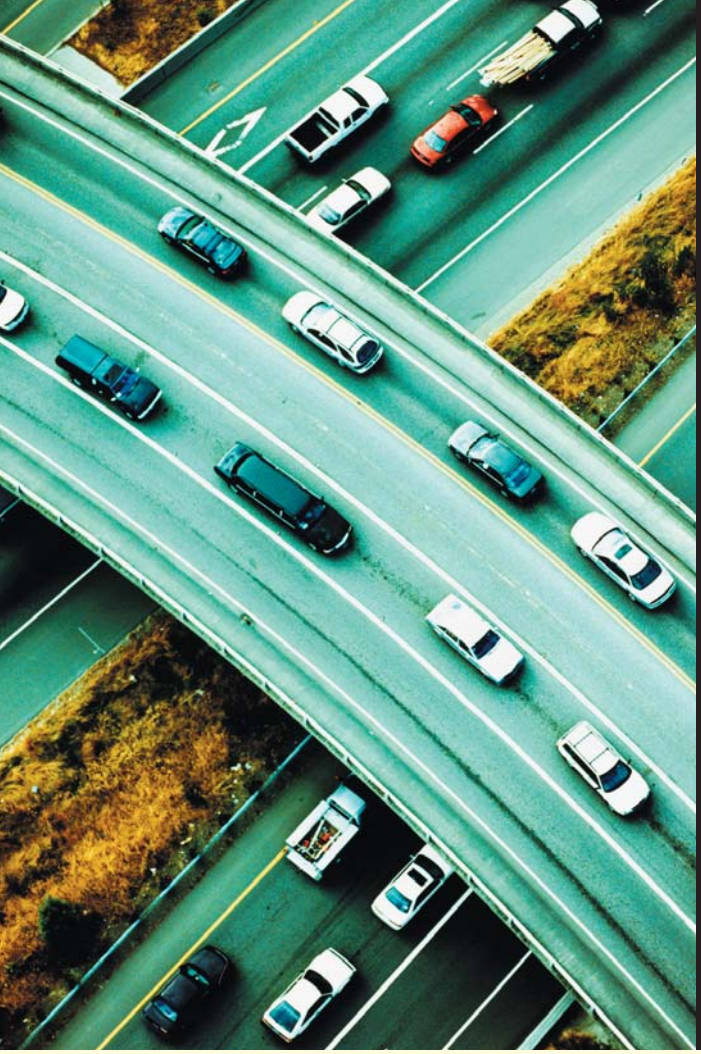
Keeping Tomorrow's Travelers Safer

Safety will continue to be a top priority as Americans keep moving through the 21st century. The Volpe Center's combined efforts in research and analysis, strategic planning and design, and new technology ensure that the goal of optimal safety performance is foremost for all transportation modes.

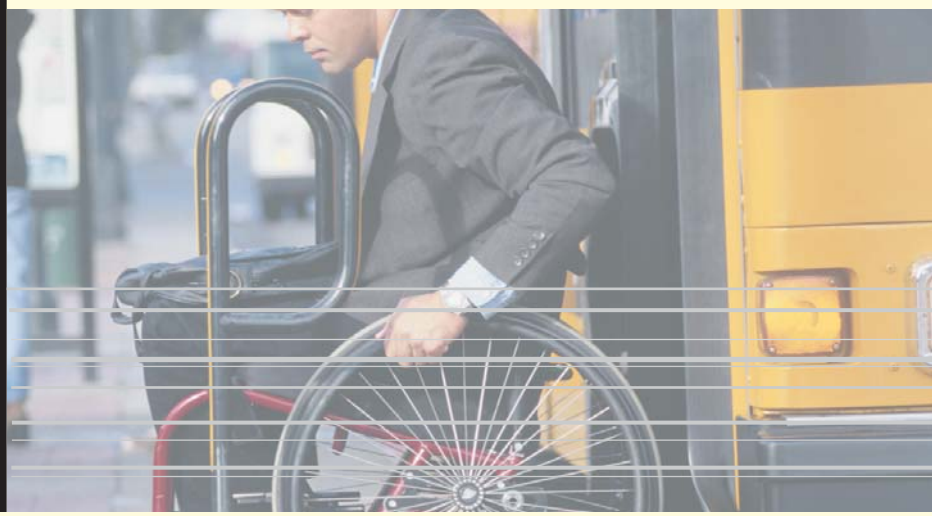
A hundred years ago, average Americans did not venture more than 20 miles from their homes during their entire lives. Today you can drive to a Park-n-Ride lot and catch the bus to a water taxi, which connects with a guided rail system that takes you to the airport so you can fly off to a faraway country…all in a few hours! And new modes of transportation are just over the horizon. The Volpe Center will continue its long-standing commitment to making every leg of the journey a safe one.

One area of focus for the Center will be new "smart" technologies such as crash avoidance technology in automobiles. The Volpe Center will continue to support development, testing, and deployment of innovative technologies that can truly deliver on the promise of improved safety.

The pages that follow contain examples of the way that the Volpe Center has responded to many safety problems or events over the years.



Mobility in passenger transportation and in the movement of goods is central to our social and economic well-being. The Volpe Center works effectively to assess and enhance mobility in support of U.S. Department of Transportation programs. The Center develops, tests, and implements improvements in mobility: advances in transportation reliability and accessibility, the expansion of the spectrum of choices offered to travelers and shippers, and increases in the quality and efficiency of the travel experience. In this work the Volpe Center fulfills key elements of its mission—to anticipate future national, state, local, and international transportation and logistics issues and requirements, to develop tools and technologies addressing them for the Center's clients, and to be a catalyst for innovation in transportation technologies and management processes.



People and Goods on the Move

MOBILITY

Mobility refers to the movement of people and goods, and the extent to which that movement takes place expeditiously and efficiently. Mobility affects each one of us, our families and neighbors, and our work.

If we wait too long on the runway for a flight to take off after boarding, or if we waste coveted weekend time in stop-and-go traffic, we are acutely aware of the effects of capacity on mobility.

If our sight-impaired parent misses schedule change information on a bus trip because it's offered only through visual information displays, or if our handicapped friend can't step up onto a tram, the importance of accessibility to mobility becomes obvious.

If the goods we need for our business are tied up on vessels because of inadequate access to unloading facilities, or if our containers sit idle because there is no double-stack rail link to a dock area, or if prices for our supplies go up because trucks consume valuable hours to reach a poorly located inner city intermodal freight center, then we realize that we must focus on how the management and technology of freight infrastructure affect economic mobility.

If our neighbor is unable to accept an employment offer because she has no car and there is no available public transportation to the workplace, we recognize the extent to which removing barriers to mobility can expand personal opportunities.

When we wait longer to transfer between bus routes than the time we actually spend in a bus, when the line at the train ticket counter adds 10 minutes to the daily commute, or when traffic lights are improperly timed, we see how using service improvements to speed up traffic flow can improve the quality of our lives and our economic productivity.

Mobility problems like these often emerge over long periods of time. They appear first on the distant horizon as minor, scattered, and tolerable irritations. Suburban and rural congestion, lack of access for disabled and disadvantaged populations, freight delays due to terminal access problems, and air traffic congestion are examples of this type of issue. By contrast, some other transportation issues arise in response to specific events in a short time period, such as those that might give rise to an automobile recall.

If a localized mobility issue is not addressed, it can gradually mature to become acute and pervasive, affecting large numbers of people and businesses. Often, vocal and organized constituencies asking for solutions emerge. By then minor problems have frequently become major ones that require ongoing programs and significant funding to study and remedy.

The Volpe Center's Mobility Initiatives

The Volpe Center has an established 30-year tradition of developing and testing a range of mobility solutions, especially in three linked areas: new technology, service innovations, and the comprehensive evaluation of new ideas and concepts. Addressing the complex and far-reaching issues of mobility affecting people and goods is a key part of the Volpe Center's support of national transportation-related initiatives. This work helps the Center serve as a federal bridge for transportation expertise between industry, academia, and other government agencies.

New Technology: Enhancing Transportation Systems

Volpe has contributed to many mobility initiatives that develop and refine new technologies, such as vehicle/guideway methods, computerized information systems to enhance the performance of existing technologies, and intelligent highways. These initiatives improve operating efficiency and reduce costs, and enhance the quality of travel and shipping for users through better on-time performance, improved safety, and shorter travel times.

Service Innovations: Improving Transportation Mobility in Our Cities and Towns

Service innovations are the transportation solutions most visible to the general public. These innovations include new services and new applications of existing services and technologies to respond to emerging or newly recognized needs in transportation. For example, the Volpe Center has played a key role in developing and implementing such initiatives as Bus Rapid Transit (BRT) systems, paratransit and ridesharing services, downtown people-mover systems, and dial-a-ride services.

Comprehensive Analysis and Evaluation: New Transportation Ideas and Concepts

During the development and adoption of mobility initiatives, the Volpe Center applies comprehensive quantitative and qualitative analysis to assess financial and operational feasibility, comparative effectiveness, and success in implementation. These analyses include a range of economic and environmental analyses to test customer response to new services and technology applications, and their effects on costs and "quality of life" indicators. Risk analysis, forecasting, human factors analysis, and simulation and modeling are techniques that are routinely refined and applied to evaluate mobility.

The Volpe Center's client-oriented work in these three broad areas can be illustrated by examples in four linked areas of current importance: access to transportation for all Americans; enhancing air travel and transport capacity; improving the technology of freight transport; and high-tech innovations for ground transport.

The following pages give some more detailed examples of the Center's work in the mobility arena.

A modern transportation system provides many benefits for America and its citizens. Yet transportation infrastructure and operations can negatively affect our natural and human environments. Necessary system expansions or improvements cannot be achieved at the expense of personal health or natural resources. Balancing transportation goals with environmental protection presents a formidable and ongoing challenge. The Volpe Center has long supported the Department of Transportation in its efforts to develop and maintain the finest transportation system in the world, while limiting and preventing the impact to our environment. The Center has also actively supported other federal, state, and local agencies in their environmental work.

Human and Natural Environment

The progression of Volpe's environmental work over the years has mirrored society's growing awareness of the need to protect the natural world. When the Center was founded, environmental issues were just emerging into public focus, initiated in part by passage of the National Environmental Policy Act of 1969 (NEPA), which established federal policy on protecting the environment. During the 1970s, attention centered primarily on responding to localized issues. With the passage of time and increased understanding, environmental concerns came to be regarded as national problems, and today reflect our sensitivity to global impacts.

Since NEPA was enacted, the federal government has enacted additional environmental legislation and regulation. The Volpe Center's activities have responded to these federal actions, beginning with supporting environmental initiatives of the DOT and expanding over time to include those of numerous federal agencies as well as state, regional, and local groups. The Center's work also reflects a strategic shift. Instead of reacting to problems, Volpe is proactively working not just to prevent environmental impacts through planning, policy, and exploration of alternative practices and technologies, but to enhance overall environmental quality through transportation initiatives.

Opening the Door on Environmental Actions

Urban noise and smog in the 1960s sparked Americans' awareness of environmental issues. Much of the Volpe Center's early environmental work related to addressing these problems. The Center created its Acoustics Facility in 1970 to develop a standard for airport noise modeling. Today, the facility performs noise-related work for several transportation modes, and its noise modeling tools are used in over a dozen countries.

The energy crisis also guided the Center's efforts in the 1970s. Volpe teams worked with federal agencies and the automotive industry to develop better fuel efficiency standards. Because energy use and the environment are intertwined, the Center's Motor Vehicle Goals Study analyzed potential air quality and other environmental impacts in developing the new standards.

Historical damage, such as the environmental devastation of the Love Canal site and later environmental incidents, strengthened Americans' desire in the 1980s for additional protections, and spurred the Volpe Center to expand into remediation work. The Center supports several federal agencies in these efforts, including asbestos removal for the Federal Aviation Administration (FAA) and the Environmental Protection Agency (EPA), and remediation of mining contaminants for the EPA.

The Center's systems approach and emphasis on knowledge-sharing allows for an agile response to emerging environmental challenges. For example, Volpe's experience in measuring noise levels in the national parks proved helpful when the Center later helped the U.S. Postal Service (USPS) assess the effects of hovercraft noise on fish and wildlife in Bethel, Alaska. The Center continues to perform risk assessments of noise levels to develop effective remediation plans in a variety of transportation settings.

From Repairing Environmental Damage to Preventing Problems

Airline and motor carrier deregulation in the 1980s led to increased impacts on air quality, and the Volpe Center continues to work in this area. These efforts expanded after Congress amended the Clean Air Act in 1990. By creating more stringent air quality standards, the legislation spawned new environmental activities for the Center, including examining the ability of urban areas to comply with the new requirements. The Center's Air Quality Facility, sponsored by the FAA in 1999, is currently working to improve analysis of air quality at airports.

As government took a more proactive approach to environmental issues, environmental analysis began to play a role in transportation projects. Passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 mandated comprehensive consideration of environmental issues when planning transportation projects. The Volpe Center has conducted many project-related environmental reviews, and is also supporting recent DOT efforts to streamline the environmental review process. Streamlining will speed implementation of transportation projects needed to serve the public and business community, while ensuring that they are environmentally responsive.

ISTEA also led to expanded exploration of alternative transportation systems and fuels. The Volpe Center has provided technical and planning support to the Federal Railroad Administration's (FRA) Maglev Deployment Program. It is also working to support development of Intelligent Transportation Systems, and is studying how they can enhance air quality.

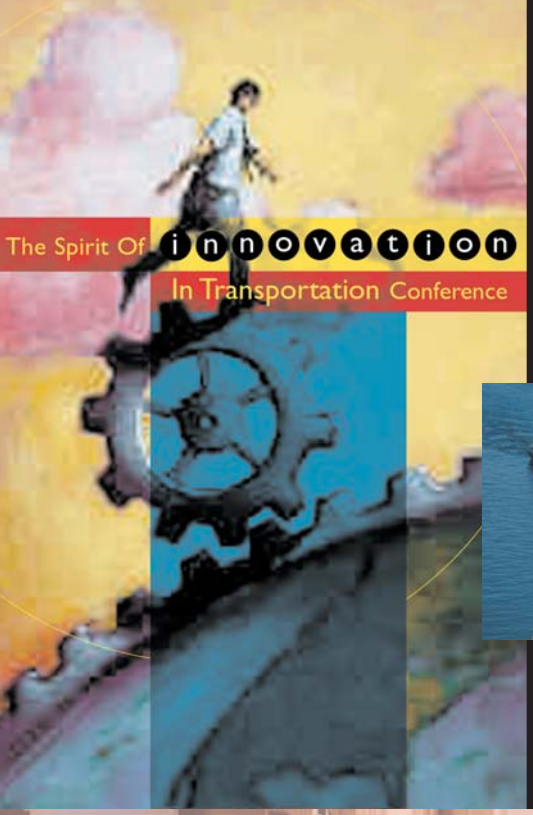
Going Global for Our Future

In the last decade, the localized, "not-in-my-backyard" attitude that arose in the 1980s has softened. The entire world is now seen as "our backyard," and there is a broader shared concern to protect the sustainability of the global environment and its resources.

As it has since its inception, the Volpe Center has adapted to the expanded cultural perspective on environmental issues. The Center supports DOT's Center for Climate Change and Environmental Forecasting, which serves as a clearinghouse for research and policy coordination related to transportation and global climate change. It also supports DOT's Advanced Vehicle Program to encourage development of "green" bus and rail transit. Keeping in step with the global approach, the Volpe Center assists other countries in developing national plans to address climate change.

America depends on a safe, efficient transportation system. At the same time, it takes pride in the quality of its natural environment. The Volpe Center will continue to support efforts to effectively achieve both priorities, while expanding its work to reflect growing recognition of the need to protect and enhance the fragile health of our planet.

The following pages present examples of our environmental work.



Transportation plays a major role in America's economy. An efficient, modern transportation system both creates and supports engines of economic growth. One of the DOT's primary goals is maintaining a comprehensive and integrated system that serves citizens and businesses and keeps our economy competitive. Achieving this goal requires innovative thinking from a skilled, committed, and energized transportation community. The Volpe Center works to foster this environment by offering opportunities to share knowledge and information, encouraging development and application of the latest technologies, and supporting professional capacity building. By fostering a climate of innovation, the Center's activities help the nation's transportation enterprise to address changing demands and explore new opportunities.

Economic Growth

The Volpe Center understands the value of knowledge, particularly how knowledge can translate into making our transportation system more efficient and more cost effective. The Center's systems approach allows comprehensive information sharing across all of its functional areas, and its commitment to ongoing staff development exemplifies the ideal of a "learning organization." The Center strives to implement this philosophy externally as well, conducting educational training and outreach efforts to support continued learning and a valuable interchange of ideas.

The Center has a long history of involvement with conferences and symposia. In the late 1970s, it supported the Harvard Business School Symposium on Government, Technology, and the Automotive Future. More recently, the Center hosted the Spirit of Innovation in Transportation Conference, designed to facilitate technological innovation in transportation. These forums provide opportunities for transportation professionals from government, industry, and academia to gather critical information on research, new technologies, policy implementation, and future trends.

A highly skilled transportation work force is also important, and the Volpe Center contributes to many continuing educational programs. The Center works with the DOT's Intelligent Transportation Systems (ITS) Professional Capacity Building Program to design and implement nationwide training on new ITS technologies. In addition to developing the existing work force, the Center supports future talent. The Garrett A. Morgan Technology and Transportation Futures Program links students with transportation professionals to create a new generation of talent that can meet tomorrow's challenges. In sum, through the dissemination and application of knowledge and technology, Volpe successfully improves our economic competitiveness by enhancing the transportation system, its efficiency, and its cost effectiveness.

Working Together to Create Better Transportation

Pooling intellectual and technological resources through public-private sector partnerships spurs innovation and expedites the transfer of technology into commercial applications. This not only benefits our transportation system's performance, it also helps make the United States more economically competitive. In accordance with this collaborative model, the Volpe Center studies ways to stimulate partnerships in the transportation sector. It recently prepared three reports that examined a variety of partnership models and assessed their potential.

The Volpe Center has been active in fostering research and development relationships with businesses and universities. These relationship have been formalized with arrangements such as CRADAs, or Cooperative Research and Development Agreements, which are a type of public-private partnership in which private companies and government agencies agree to work together on a specific R&D project. These agreements allow the partners to make the most of their resources and reduce expenses by sharing the costs of research, pooling personnel, services, facilities, or equipment. The Center further supports innovation and economic growth by facilitating the entry of new players into the transportation sector and providing incentives for small business, thereby strengthening competition, fostering greater efficiency and lowering the cost of transportation.

Setting the Standards for Transportation Performance

Developing and applying uniform standards and protocols supports the transfer of transportation knowledge and technology both nationally and around the world. It also ensures enhanced systems functionality. In the 1970s, the Volpe Center worked with agencies, industry, and academia to develop motor vehicle fuel efficiency and safety standards. Today, Volpe teams are working with similar groups to harmonize ITS architecture.

Robust international trade is a key determinant of success in an increasingly global economy. The Volpe Center is consulting with several agencies to coordinate safety and environmental standards with U.S. trading partners under the North American Free Trade Agreement (NAFTA).

The Center also supports initiatives to encourage adoption of international standards and operational protocols. The Volpe Center assists DOT agencies in adopting the International Organization for Standardization (ISO) protocol, which is becoming recognized worldwide as the accepted standard of quality in products and services. The Center also works with the International Civil Aviation Organization to better integrate operation of the global positioning satellite navigation system.

Sustaining economic health in a changing world presents continual challenges. As we forge ahead into the 21st century, the Volpe Center's efforts to nurture a culture of knowledge and innovation ensure that we have a state-of-the-art transportation system that supports our economic vitality.