

The **U.S. Department of Transportation's Volpe Center**
and the **U.S. Department of Defense**

A Successful Partnership



The Volpe Center has provided essential support to the DoD for nearly **50 years.**

The U.S. Department of Transportation's (U.S. DOT's) **Volpe Center** and U.S. Department of Defense (**DoD**) have had a long-standing **memorandum of understanding** that encourages all DoD commands and organizations to leverage the Volpe Center's world-renowned, multidisciplinary expertise in all modes of transportation.

The agreement reinforces the U.S. DOT's critical support of DoD's important transportation and logistics-related mission.

Cover: The Volpe Center's expertise in upgrading critical air traffic control facilities and landing systems at military air bases in the U.S. and throughout the world has led to safer military and civilian aviation operations. (Photo: U.S. Air Force) **Below:** The U.S. Army's newest addition to its locomotive fleet, the USAX 6524, is an EPA Tier 4-certified locomotive. (Photo: U.S. DOT/Volpe Center)



Working Collaboratively in Support of National Objectives

Multimodal Infrastructure Modernization and Planning

Rail

The Volpe Center has provided long-standing technical expertise to the DoD to modernize locomotives and rail infrastructure critical to the U.S. Army's mission. To increase the efficiency, reliability, and safety of operations on U.S. Army installations, the Volpe Center provides engineering expertise, technical specifications, and procures new equipment to service aging railway infrastructure.

Volpe Center engineers perform equipment inspections and assessments, and provide efficient solutions that meet the requirements of specific locations. The U.S. Army has added several highly efficient GenSet Road-Switcher locomotives to its rail fleet.

Aviation

DoD continues to replace its outdated equipment in radar approach control facilities across the globe. The Volpe Center recently completed optimizing the final Airport Surveillance Radar Model II, which will provide DoD with state-of-the-art surveillance capabilities. The Volpe Center has also helped DoD upgrade its radar display system with newer technology known as the Standard Terminal Automation Replacement System.

Volpe Center engineers added the national air traffic control (ATC) system backbone known as Automatic Dependent Surveillance-Broadcast (ADS-B) to several U.S. Air Force sites. This digital technology is more reliable and is able to self-diagnose most failures.

The Volpe Center played an important role in the DoD National Airspace System (NAS) Deployable Radar Approach Control, an ATC system that can be deployed worldwide in support of U.S. armed forces and humanitarian operations. A Volpe Center team provides engineering and technical support for U.S. Air Force mobile and fixed-base ATC system development, procurement, testing, and sustainment. The team also performs ATC system site surveys, site preparation, installation, and engineering support for allied nation system procurement and ATC facility design and construction.

Infrastructure Planning and Development

The Volpe Center performs infrastructure planning and development for several branches of the U.S. military.

Volpe experts worked on a program jointly funded and managed by the U.S. Navy and U.S. Air Force that constructed the world's most powerful and

versatile ionospheric research facility in Gakona, Alaska. Research at the facility was used to analyze basic ionospheric properties and assess the potential for developing ionospheric enhancement technology

for communications and surveillance purposes. The Volpe Center managed all environmental compliance and permitting during construction and operation of this unique facility. ■

Resilience

Global Positioning System

The U.S. DOT is the civil lead for the Global Positioning System (GPS) and works closely with the DoD in the development, acquisition, management, and operation of GPS. The Volpe Center supports this mission by providing systems engineering expertise in working with the U.S. Air Force on implementation of GPS civil signal performance monitoring within the Next Generation GPS Operational Control System.

The Volpe Center is also conducting a GPS Adjacent Band Compatibility Assessment in conjunction with the U.S. Air Force and other interagency partners. The goal of this effort is to understand the power levels that can be tolerated in the adjacent radio-frequency bands by existing and evolving GPS and Global Navigation Satellite System (GNSS) receivers.

The Volpe Center works closely with the DoD and the Department of Homeland Security (DHS) to increase awareness of GPS vulnerabilities, evaluate the impact, and research complementary sources of positioning, navigation, and timing. This effort will increase resiliency for safety-critical transportation applications and make intentional jamming and spoofing of GPS less desirable.

Understanding the Impact of Disruption

Coastal flooding and storm surges are becoming an increasingly challenging and disruptive occurrence, particularly for military installations and communities located near tidal zones. Volpe Center analysts have collaborated with U.S. DOT agencies to create a tool to help estimate the impacts of transportation

An amphibious assault ship navigates through dense fog via GPS technology while underway off the Atlantic Coast.

(Photo: U.S. Navy)





Construction workers load a power pole onto a truck to make room for its replacement at Beale Air Force Base, California. The new poles will weather storms more reliably and help meet Beale's increased energy demands. (Photo: U.S. Air Force)

disruption caused by extreme weather in Hampton Roads, Virginia — home to the world's largest naval base. The analysis assists defense and civilian decision makers in better understanding the potential direct and indirect impacts, and managing the risks related to recurrent flooding and storm surge.

Resilient Energy Partnership

The U.S. Air Force brought together the Volpe Center, RAND Corporation, the National Renewable Energy Laboratory, MIT Lincoln Lab, and the Air Force Research Lab to develop a comprehensive energy resilience strategy in response to the challenges arising from the Air Force's energy vulnerabilities. Beale Air Force Base (AFB) served as the pilot site for the Resilient Energy Demonstration Initiative.

The Volpe Center applied its novel Resilience Toolkit, which provides decision support for future cost-effective energy architecture selections. The Volpe team created a detailed energy resilience analysis based on Beale AFB data and is now documenting the best practices in resiliency at Beale for use by the U.S. Air Force at bases across the globe.

Cybersecurity

The Volpe Center's auto-cybersecurity lab tests vulnerabilities and the efficacy of cyber intrusion detection devices for vehicle telematics and wireless systems. Volpe engineers and information technology specialists developed guidance for government fleet managers on selecting cybersecurity mitigation solutions, including nontactical DoD vehicles for the U.S. Air Force, Army, Navy, and Marines.

In addition, the Volpe Center provided government fleet managers with a cyber-security primer to raise their awareness of the responsibility for managing risk related to cybersecurity when selecting and implementing a fleet efficiency management tool. Volpe Center specialists also perform aftermarket device testing, such as diagnostic tools, fleet management devices, and aftermarket cybersecurity solutions.

The Volpe Center also participates in FAA's multi-agency work group, providing a path forward for interagency aviation cybersecurity. The FAA-led effort brings together the U.S. Air Force, NASA, and DHS to establish a sustainable foundation for multi-agency collaboration on NextGen cybersecurity. ■

Automation and Advanced Technology

Unmanned Aircraft Systems

Volpe Center experts are working collaboratively with DoD, FAA, NASA, other federal agencies, industry, and academia on challenges and opportunities related to unmanned aircraft systems (UAS).

The U.S. Air Force increasingly uses remotely piloted aircraft (RPAs) for critical missions, and is focused on finding ways to safely operate alongside manned aircraft in the NAS.

Volpe Center engineers have worked closely with the U.S. Air Force to develop a low-cost automated solution, enabling RPA operators to sense and avoid other aircraft and to deploy a ground-based sense-and-avoid program. The program uses existing air traffic data to provide RPA operators with a real-time display of aircraft in the surrounding airspace, alerts operators to potential conflicts with neighboring aircraft, and recommends evasive maneuvers to avoid a collision.

The Volpe Center is also reviewing how additional RPAs operating in the NAS will impact current and planned procedures and infrastructure in the years ahead.

Connected Automated Vehicle Testing and Evaluation

The Volpe Center has partnered with the Federal Highway Administration's Turner-Fairbank Highway Research Center and the Army's Aberdeen Test Center (ATC) to develop, test, and evaluate connected automated vehicle mobility applications that include passenger car-heavy truck platooning based on cooperative adaptive cruise control.

Volpe engineers devised the test methodology and collaborated with ATC engineers to develop the testing safety mitigation plans, collect data, and evaluate the performance and capability of the vehicle-to-vehicle communication system and cooperative vehicle mobility applications. ■

Strategic Mobility

The Volpe Center works with international partners to provide solutions for transportation and logistics challenges. Volpe Center analysts collaborated with the United Kingdom Ministry of Defence (MOD), Surface Cargo Information Systems on the Remote Access Movements Portal. This joint development between MOD and the Volpe Center displays real-time information on the movement of cargo across multiple modes of transport, and shows this information on an easy-to-use, map-based web display.

Like the DoD, the MOD relies on both military and commercial transport to move valuable equipment around the world. Volpe's logistics experts designed and developed the infrastructure to track and reconcile payments made on the movement of MOD goods. As a result, the MOD has saved millions in taxes and has made major efficiency improvements to the cargo movement process. ■



SeaVision's Map: Used for displaying, tracking, filtering, and searching thousands of vessels around the world, in near real-time. (Image: U.S. DOT/Volpe Center)

Enhancing Maritime Safety and Security

A critical mission focus shared by DoD and U.S. DOT is maritime domain awareness. Renowned for its major technological advances in communication, traffic management, and marine navigation systems, the Volpe Center is at the vanguard of developing and deploying state-of-the-art, easy-to-use, cost-effective vessel tracking networks that increase maritime domain awareness, safety, and security worldwide.

The Volpe Center developed two powerful tools for the DoD:

- Over 70 participating nations leverage the Maritime Safety and Security Information System (MSSIS), a low-cost, unclassified, and near real-time network used to track commercial vessels worldwide.
- SeaVision uses Google maps to display ships and enables governments to view, track, and analyze vessel movement to combat human trafficking, weapons smuggling, illicit drug trading, piracy, and illegal fishing. ■

Economic and Cost-Benefit Analysis

The Volpe Center conducts economic and industry analyses for the U.S. Transportation Command (USTRANSCOM), calculating fuel, currency, and inland freight adjustment factors for military marine and inland shipping.

Volpe Center economists helped determine the risks associated with fixed-price contracts over time and how changes in high-variance input costs

affect the economics of marine container shipping. The Volpe Center analyzed historical shipping patterns of USTRANSCOM goods along with worldwide vessel capabilities to understand the financial variations of the ocean carrier industry. The Volpe Center proposed clear and actionable adjustment factors for USTRANSCOM to apply to ocean carrier contracts. ■

U.S. DOT's Volpe Center Capabilities

The Volpe Center is the U.S. DOT's in-house resource for multimodal systems engineering and integration, technology, analysis, planning, research, development, deployment, and evaluation.

With an extensive set of skills and capabilities pertinent to DoD's mission, the Volpe Center provides key support in the following areas:

- **Economic**, energy, data, financial, lifecycle cost, and **cost-benefit analyses**
- **Resilience and risk analysis** of transportation systems
- **Automation** of physical distribution processes and vehicles
- **Cybersecurity**, safety, and resiliency of cyber-physical systems
- Engineering and **human factors testing and evaluation** of advanced technology transportation systems
- Command, control, and communication of **unmanned aircraft**
- Development of **resource and information management** systems
- Development and deployment of **web-based applications**
- **Environmental** compliance and permitting
- Occupational **safety and health**
- **Fire safety engineering** for air traffic control towers
- **Systems assessment and evaluation** of transportation-related technologies that directly apply to **the mission and responsibilities of the DoD**

Thank You to Our DoD Partners

Air Mobility Command

Defense Threat Reduction Agency

Joint Improvised-Threat Defeat Organization

Office of the Chief of Naval Operations

Office of the Secretary of Defense

U.S. Africa Command

U.S. Air Force

U.S. Army

U.S. Navy

U.S. Naval Forces Africa

U.S. Navy International Programs Office

U.S. Transportation Command