PROTECTING AMERICA’S ROADS, BRIDGES, AND TUNNELS:
The Role of State DOTs in Homeland Security

American Association of State Highway and Transportation Officials

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The photographs in this publication illustrate a variety of catastrophic events, including earthquakes, hurricanes, and major blackouts that can have impacts to transportation that are similar in magnitude to a serious terrorist attack.
On September 11, 2001, state departments of transportation (DOTs) — builders and operators of the nation's busiest roads, tunnels, and bridges — were reminded vividly about the vital role that transportation often plays when emergency situations occur. As DOTs across the country went on high alert, the emergency capabilities of highway, transit, rail, and pedestrian systems in the New York and Washington, D.C. regions were tested severely. Transportation links functioned as evacuation routes and a way for emergency response teams to reach incident scenes. Virginia DOT's high-tech Traffic Management Center in Arlington, Virginia was even transformed into the incident command headquarters for emergency responders after American Airlines Flight 77 hit the Pentagon. In subsequent days and months, transportation agencies mobilized intensive construction efforts to help reconnect transportation links damaged by the terror attacks.

State DOTs were able to act swiftly on September 11 because they were already equipped to meet the challenges of responding to and recovering from the devastation caused by natural and man-made disasters. When incidents such as hurricanes, wildfires, earthquakes, or major traffic crashes threaten safety and mobility, DOT personnel and equipment are part of response and recovery activities. Their sophisticated traffic management systems help keep traffic moving; their information systems help keep communications flowing; and their construction expertise helps speed recovery.

The threat of terrorism, however, poses new challenges for state DOTs. Eighty percent of DOTs say they have incurred additional costs to improve transportation security, and overall security costs for DOTs are expected to reach at least $10.5 billion over the next six years. Through the National Cooperative Highway Research Program, AASHTO and the state DOTs have invested heavily since 2001 in security-related studies, training, and research. More training, equipment, infrastructure hardening, and research for DOTs is vital.

To ensure the security of our nation's transportation systems, AASHTO member DOTs and local, state, and federal agencies must become strong homeland security partners. This brochure gives an overview of why the security of our roads, bridges, and tunnels is important, what DOTs are doing to improve it, and the keys to better partnership.
The nation’s transportation system ensures workers get to their jobs, goods and services reach their destinations, and people stay connected. State DOTs keep the country moving. Together, they have primary responsibility for a system that includes most of the nation’s busiest highways, bridges, and tunnels, and totals 1.8 million lane-miles. But DOTs are also multimodal agencies whose responsibilities often include passenger and freight rail, transit, ports, ferries, and aviation.

Every day, vehicles travel five billion miles on state-owned roads and 89 percent of all freight by value is shipped on highways. Businesses rely on a “just-in-time” economy in which a single unexpected incident can have significant effects. The week-long shutdown of all seaports and airports following September 11, for example, is estimated to have resulted in economic losses as great as the $50 billion World Trade Center costs.

The apparent scale and redundancy of the nation’s transportation system gives a false sense of security, but in many parts of the country that system is straining to keep up with the transportation demands of society and the economy. Preliminary studies suggest there are about 1,000 bridges across the country where substantial casualties and economic disruption would result from isolated attacks. Seized Al Qaeda training manuals include missions for blasting and destroying bridges leading into and out of cities, and senior Al-Qaeda leaders in U.S. custody have revealed that several U.S. landmark bridges were included on a list of possible targets for their terrorist network. The Mineta Institute’s listing of terrorist activities shows terrorist-related incidents have occurred in many states over the past five years (see map).

The costs of failure to prepare for a terrorist attack that affects the nation’s transportation infrastructure, in terms of loss of life and economic disruption, could be catastrophic. Experts fear attacks that destroy or damage transportation infrastructure, for example using incendiary devices, handheld cutting devices that sever bridge components, release of chemical or biological agents in
tunnels, or explosives would jeopardize safe, continuous movement of people and goods. Likewise, they agree that the costs of rebuilding following a major attack would be great. A Federal Highway Administration/AASHTO-sponsored Blue Ribbon Panel recently concluded that costs could exceed $10 billion for loss of a critical bridge or tunnel.5

In response to the threat of terror, state DOTs — the nation’s transportation infrastructure managers — are adapting and expanding their traditional functions to better protect transportation systems and preserve user safety. Foremost among DOTs’ expanded roles are:

“ALL HAZARDS” EMERGENCY MANAGEMENT. DOTs have always played a vital support role in emergency planning, response, and recovery situations. Today, they are working to ensure terrorism-specific challenges are met.

CRITICAL ASSET PROTECTION. DOTs are conducting assessments, investing resources, and incorporating new practices on an agency-wide basis to ensure protection of critical assets they oversee.

The new roles DOTs are undertaking bring with them new demands for training, research, resources, partnership, and communication that are described in this brochure. Total costs for protecting critical mobility assets, enhancing traffic management capabilities, and improving state DOT emergency response capabilities nationwide are conservatively estimated to be $10.5 billion over the next six years.6

PROTECTING AMERICA'S ROADS, BRIDGES, AND TUNNELS:

A VITAL SUPPORT ROLE IN EMERGENCY MANAGEMENT
DOTs’ Expertise:

The consequences for transportation of incidents such as earthquakes, floods, tornadoes, hurricanes, or major traffic crashes, can be quite similar to those of terrorist attacks. Overloaded or blocked transportation infrastructure can slow down responders, hamper evacuations, or trigger secondary incidents. As recovery efforts get underway, economic and social dislocation may be caused or worsened by damage to infrastructure or traffic problems. Over 90 percent of state DOTs have in place “all hazards” emergency management plans that enable them to respond quickly to serious incidents regardless of their cause.

“All hazards planning” means that state DOTs are ready to work with other emergency responders in a variety of emergency preparedness, response, and recovery activities. When incidents directly affect the transportation network, DOT field personnel may well become initial responders. Key functions include:

TRAVELER INFORMATION. Keeping travelers informed is imperative for managing traffic during and after an incident. Information officers in DOTs are set up to work with radio and television media to share important information with the public. Agencies routinely use technologies such as the Internet, highway advisory radio, 511 travel information, and variable message signs to communicate information about road closures, detours, and evacuation routes to travelers, and to work with local transit agencies.

TRAFFIC MANAGEMENT. Serious incidents are likely to require immediate implementation of temporary traffic management measures. In New York on September 11, for example, the George Washington Bridge in northern Manhattan was shut down minutes after the attack and a network of variable message signs up to 12 miles away was used to warn drivers and redirect traffic. Many DOTs operate Intelligent Transportation Systems (ITS) in larger cities and rely on electronic technology such as traffic cameras, ramp monitoring, roadway sensors, and message signs to monitor and manage traffic. They are equipped to support emergency responders by managing traffic and ensuring good responder access to incident sites.

TRANSPORTATION FACILITIES, PERSONNEL, AND EQUIPMENT. During and after an incident, a wide variety of facilities, personnel, and equipment may be needed to provide adequate response. State DOTs are equipped with a variety of passenger and utility vans and trucks, aircraft, and ground and operations personnel that can be mobilized statewide during and after an incident. Some DOTs even have their own state-wide wireless communication networks.DOTs also have vehicle repair facilities and personnel, parking, and storage areas that can be used for staging, parking, and storage of

Case Study: Baltimore Tunnel Fire. How State DOTs Participate in Emergency Response Efforts

On a weekday in July 2001, just before rush hour, a CSX freight train derailed and caught fire in a rail tunnel directly beneath Baltimore’s downtown business district. As personnel from eleven local, state, and Federal agencies converged on the scene, the train burned out of control and thick smoke poured from the tunnel’s south portal immediately adjacent to the Orioles’ Camden Yards baseball field and I-395. By 4:30 p.m. the city fire department had ordered all major roads into the city closed including several Interstate routes.

MDOT’s modal agencies played vital roles throughout the tunnel fire in maintaining traffic flow. The Coordinated Highways Action Response Team (CHART) posted notices on variable message signs advising motorists on closures of major routes into the city. State toll authority personnel coordinated temporary closure of I-395 into Baltimore. MDOT worked with city officials to contract for emergency repairs once the fire was extinguished. The state’s transit operators coordinated light rail, bus, and commuter rail operations.

(Source: Effects of Catastrophic Events on Transportation Management and Operations, USDOT, 2002)
emergency vehicles, and motor pool facilities and personnel for refueling and servicing emergency vehicles.

**INFRASTRUCTURE RECONSTRUCTION CAPABILITIES.** As the story begins to leave the headlines, recovery efforts are usually just starting for major incidents where infrastructure damage is severe. If transportation facilities are targeted or they experience ancillary damage, a stiff economic toll may be exerted if they are closed to traffic, particularly when alternate routes are not readily available. In such instances, pressure to rebuild quickly is often intense. State DOTs oversee hundreds of infrastructure construction projects every year. Their access to heavy equipment and contracting capabilities make them uniquely qualified to lead or support reconstruction efforts. The capabilities of state DOTs to accelerate rebuilding of infrastructure following a major incident are illustrated by the experience in California following the 1994 Los Angeles earthquake. (See sidebar.)

**DOTs’ Needs:**
A recent study estimates state DOTs’ budget needs for emergency management alone at $8 billion over the next six years. Resources are needed to address:

**ENHANCED ITS CAPABILITIES.** Only 25 percent of the freeway network in the 78 largest metropolitan areas is covered by systems that allow monitoring of traffic conditions and communication with users in the event of an incident or emergency. Nationwide expansion and enhancement of ITS systems are required to support homeland security needs.

**IMPROVED EMERGENCY RESPONSE.** Current traffic management capabilities focus primarily on congestion and incident management. Education and equipment are needed by DOTs to expand their emergency response capabilities, for example to prepare for quarantine and evacuation situations or handling of incidents as crime scenes.

**BETTER COMMUNICATIONS.** Ninety-four percent of DOTs cite communication interoperability as a major concern. DOT personnel lack appropriate communications interoperability with other emergency responders, and they are often unfamiliar with basic Incident Command System protocols or other emergency response procedures. Investment in training and equipment is needed to keep DOTs in sync with other agencies.

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8 Parsons Brinckerhoff and SAIC, National Needs Assessment for Ensuring Transportation Infrastructure Security, 2002.
PROTECTING CRITICAL TRANSPORTATION ASSETS

DOTs’ Expertise:

Most of the transportation system is characterized by features such as physical robustness, ease of replacement, system redundancy, and limited potential for mass casualties that make it a relatively unappealing terrorist target. By contrast, specific transportation facilities, including those that span large natural barriers such as rivers, bays, or mountains, and serve unique regional or national transportation and economic roles, may be attractive targets. Vulnerability of critical assets depends on their size, type, design, and setting. Use of vehicle or boat-borne explosives by terrorists could cause severe damage or collapse of structures.

All DOTs have access to, and a large majority (84 percent) are using AASHTO guidance on vulnerability and criticality assessment and risk management to determine the extent and nature of threats to their state’s transportation system. This guidance was developed under the National Cooperative Highway Research Program. Based on the results of these analyses, they are developing countermeasure techniques to detect and prevent attacks on critical infrastructure and minimize damage in the event they occur. Countermeasures include:

- **DETERRENCE AND DETECTION** of attacks by securing access to structures or mechanical systems, improving lighting, conducting frequent patrols, and installing electronic detection systems;

- **DEFENSE** against attacks by installing physical barriers that increase stand-off distances from vulnerable structural components, such as bridge piers or tunnel ventilation systems; and

- **DESIGN AND RE-DESIGN** of assets to harden them against potential attack methods, particularly explosive charges.
DOTs’ Needs:
A recent study estimates state DOTs’ capital and operating budget needs for protecting critical assets at $2.5 billion over the next six years. Resources are needed to address:

**BRIDGE RETROFITS.** Critical bridges must be retrofitted with countermeasures such as blast shielding, structural reinforcement, lighting, intrusion detection systems, barriers and fencing, and security patrols.

**BRIDGE RECONSTRUCTION.** Most major bridge construction activity involves reconstruction or rehabilitation of structures as they reach the end of their useful life. As critical bridges are replaced or rehabilitated, an opportunity arises to incorporate more advanced design features such as layout considerations, pier placement, and blast survivability. The marginal additional cost of these types of improvements is assumed to be about 20 percent of total bridge reconstruction costs.

**TUNNEL PROTECTION COSTS.** Most tunnels are relatively robust and invulnerable to serious damage. Protection needs are primarily focused on enhanced detection and surveillance, and protection of sensitive areas such as portals and ventilation intakes.

DOTs Need Flexible Solutions

No two transportation agencies share exactly the same characteristics. One-size-fits-all transportation security solutions that offer no flexibility may in fact compromise the capability of DOTs to craft effective policies and programs that support homeland security. Key differences include:

Organizational Structures. These vary among agencies. For example, key functions are sometimes decentralized to field offices, and use of contractors for design, construction, and maintenance services varies widely.

Extent of State-Maintained Highway Systems. As a rule of thumb, DOTs have responsibility only for their state’s busiest roads, but some DOTs oversee many less traveled roads too. For example, North Carolina DOT oversees 77 percent of its state’s roads. On average, states oversee about twenty percent of all roads.

Multimodal Responsibilities. In most states, the DOT’s transportation responsibilities extend beyond highways. Many provide support to local transit agencies. Some are extensively engaged in support for freight and passenger rail service. A few state DOTs operate ferry services. A handful of DOTs have significant oversight responsibility for ports and commercial airports. Most have responsibility for general aviation facilities.

Other Transportation Functions. Some DOTs also are responsible for motor carrier services (e.g. permitting, safety inspections, enforcement, and registration), motor vehicle services (e.g. registration and licensing), and highway patrol.

THE ROAD AHEAD—SETTING AN AGENDA FOR PARTNERSHIP IN SECURITY

Just like their homeland security partners, state DOTs are establishing new security-related roles in response to the threat of terrorism. DOTs need to be considered as first responders in terms of support from the Department of Homeland Security:

EMERGENCY MANAGEMENT. State DOTs must continue to adapt and expand their emergency management support role to meet new homeland security needs.

CRITICAL INFRASTRUCTURE PROTECTION. State DOTs must continue to identify and protect critical highway, bridge, and tunnel assets.

This brochure highlights the expertise that DOTs are building in these areas, as well as some of the critical needs that they are working to address. Creating and implementing the right solutions for keeping America’s roads, bridges, and tunnels safe, however, will ultimately depend on new and powerful partnerships.

State DOTs’ partners include the U.S. Department of Transportation, the U.S. Department of Homeland Security (including the U.S. Coast Guard, the Federal Emergency Management Agency, and the Transportation Security Administration, Information Analysis and Infrastructure Protection, Science and Technology, and Customs and Border Protection), intelligence agencies, the U.S. Department of Defense, Federal law enforcement agencies, local transit agencies, railroad operators, airport operators, trucking associations, port authorities, bridge and tunnel operators, state emergency management agencies, local and state public health and safety authorities, and local and state law enforcement and first responders.

State DOTs have identified four cornerstones for strengthening partnerships with other groups: recognition of DOTs’ vital role in emergency management and homeland security, responsiveness to road, bridge, and tunnel asset protection needs, additional resources for DOTs to meet homeland security challenges, and support for transportation-related security research.

FOR MORE INFORMATION:

AASHTO’s security website: http://security.transportation.org
Transportation Research Board’s security website: http://www4.trb.org/trb/homepage.nsf/web/security
THE CORNERSTONES FOR PARTNERSHIP

Recognition of DOTs’ vital role in emergency management and homeland security

State DOTs need a “seat at the table” within the emergency management and homeland security communities that is commensurate with their responsibilities and ensures they are represented adequately. This includes access to training activities, communications equipments and threat intelligence and reporting.

Responsiveness to road, bridge, and tunnel asset protection needs

Transportation security activities to date have generally heavily emphasized aviation-related needs, recognizing that this sector houses appealing terrorist targets that deserve close attention. Assistance for other modes of transportation, particularly highways, has received a much lower priority. As homeland security policy matures, greater attention must be paid to highway asset protection.

Additional resources for DOTs to meet homeland security challenges

As they adapt to the post-September 11 world, state DOTs are taking on new and unanticipated roles with significant capital and operating costs. DOTs need resources to implement homeland security initiatives. As DOTs expand their emergency management programs and invest in critical infrastructure protection, the cost should not come at the expense of existing programs intended to find the core infrastructure programs.

Support for transportation-related security research

In Fiscal Year 2004, highways received just $3 million, or one percent of the Department of Homeland Security’s $247 million research and development budget.\(^\text{14}\) More support for research is vital, particularly regarding blast effects on bridges and tunnels and appropriate methods for retrofitting facilities and future design and construction methods.
