Lessons Learned: A Balanced Approach

The realities of the 21st century—the global economy, interdependent systems, and increasing terrorist threats—necessitate a broad and balanced approach to transportation security. Creative solutions that are also practical and affordable require diverse viewpoints and interdisciplinary skills, as well as the collaboration of government and industry as these solutions are developed, tested, and deployed.

In this *Journal* we describe some of the crucial transportation security work carried out by the Volpe Center over the last thirty years. The Center has built on its own experience as an independent technical research organization as well as learning from the research of others, and is well positioned to serve the nation as it continues to grapple with the possibilities of future attacks. When faced with the aftermath of an event such as the attacks of September 11, the government is compelled to respond wisely, to manage resources effectively, and to avoid unintended consequences.

Threats to transportation security are becoming more sophisticated. Volpe experts apply their knowledge and experience—their lessons learned—to continually offer new information, informed perspectives, and best practices. Strategies to address security problems focus on identifying and preventing threats and minimizing potential impacts. A sound analytical foundation is a critical element in establishing plans, actions, and priorities for successful solutions.

Risk Assessment and Prioritization

As the task of identifying risks continues, risk assessment models must be refined to enable decision makers to choose the right investments. Our work in risk assessment has demonstrated the need to identify potential security risks and understand the interdependencies of our infrastructure and how vulnerabilities escalate in response to these interdependencies. The more complex and integrated our infrastructures become, the more vulnerable they are to unintended consequences. With its systems approach, the Volpe Center can identify physical, geographic, cyber, and logical interdependencies, analyze system-level failures, and anticipate consequences.

Volpe Center's risk model includes a process for assessing the costs and benefits of each proposed countermeasure to determine where security investment can be most beneficial. The analysis identifies the direct costs and security benefits from each measure, and the trade-offs between security and safety, local versus national investments, and intelligence gathering versus loss of privacy.

The Volpe Center has found that because it does not have regulatory oversight over industry, it has gained industry's confidence as it focuses on transportation issues. For example, the Center's independent evaluation of relying solely on GPS technology for navigation was accepted by all the players and led to an action plan that will ensure adequate GPS backup systems are maintained.

Vulnerability Mitigation

The efforts to mitigate the vulnerabilities of the transportation system reported in this *Journal* use advanced technologies such as tracking systems using GPS, screening systems using biometrics, explosive detection systems, and other electronic identification devices. These technologies help identify the emerging vulnerabilities, take measures to prevent them, and help harden the infrastructure to withstand unanticipated threats. The Volpe Center has found combining technological approaches with a systematic integration of human, physical, cyber, and operational factors makes the approach more effective. Security is integrated into the planning, development, deployment, and operation of a system.

Consequence Reduction: Response and Recovery

The Volpe Center's work has focused on the importance of an immediate and well-planned response to emergency situations and on mitigating the long-term consequences of disasters. Volpe Center studies have demonstrated that when there are emergency response plans in place, and when emergency personnel have been adequately trained, and when strong relationships are established among the different organizations

responding to emergencies, then the disastrous consequences of emergencies can be reduced. A recent participant in the Connecting Communities Forums sums this up by saying, "It has never been more important in our lifetime that the nation's first responders and transit managers work together. We must understand each other's roles in an emergency and communicate with each other today, tomorrow, and in the future."

Addressing the long-term consequences of attacks or other disasters requires expertise. In supporting the EPA's clean-up efforts in Libby, Montana and Stockton, Utah, the Volpe Center developed a methodology using a combination of technological and management approaches. Through the insights and experience gained in supporting the EPA in these recovery efforts, the Volpe Center could effectively participate in containing and recovering from terrorist-related contaminations such as anthrax in the mail chain—should that be necessary.

Balancing Security, Economic Growth, and Resiliency

Although concern about terrorism is well justified, radical responses to the threat of terrorism, or to actual attacks, could have devastating unintended consequences. For example, the effect of a bomb exploding in a cargo container at a U.S. border would be far more than the immediate physical damage—ports and borders would likely be closed for an extended period. Given that the "just-in-time" economy depends on rapid, reliable delivery of goods, disruption of the shipping industry would have disastrous impacts on the global economy.

Recently we have seen some effects of government response to disaster. After September 11, delays at the U.S.-Canadian border prompted Ford to stop some production lines temporarily, and Toyota nearly stopped production because parts shipped by air were unavailable. On November 12, 2001, bridges to New York City were closed for several hours after the crash of Flight 587.

Balancing security and economic growth requires a solution enabled by advanced technologies, not closed borders or reduced global trade. The Volpe Center pilot project on deployment of electronic seals and smart containers to ensure the secure movement of cargo containers through the global supply chain is one example. Efficient solutions also need to balance security and system resiliency. Serious vulnerabilities could result from focusing resources on prevention or mitigation of terrorist attacks while neglecting the more typical threats to infrastructure—such as weather, accidents, technology failure, or lack of maintenance. The proper allocation of resources must be determined. Much of the private sector efforts to build efficiency and stability into our infrastructure have been vital to economic growth and public mobility. However, this has been at the expense of critical system resiliency and robustness.

Advances in information technology have contributed to developing more sophisticated systems to identify and screen travelers and workers. But the public's demand for safety may become tempered with concern about personal privacy. The trade-offs of security and privacy must be researched, understood, and incorporated into solution development.

Collaboration is Key

Managing complex risks requires collaboration across public and private sectors and between research agencies and national laboratories. The Volpe Center was formed as an independent organization that could provide analytical, scientific, and engineering support to the U.S. DOT and was envisioned as a place where a broad range of skills could be focused on major issues that cut across the traditional modal structure of the transportation enterprise. In this role, the Center is directly engaged with the real-world transportation community as well as with organizations that develop innovative strategies. The Center's link between these two worlds enables it to assess the security requirements of the transportation community, evaluate technological approaches to security needs, and assist in the implementation of technological solutions. The Volpe Center has learned that for transportation security solutions to be effective, their development must take into account political, technical, operational, societal, economic, institutional, and environmental issues.

As the Department of Homeland Security assumes the lead in the transportation security arena, the Volpe Center is ready to share its knowledge and expertise and continue to work collaboratively to address security issues.