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Selective Screening of Rail Passengers, MTI 06-07

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MTI

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SELECTIVE SCREENING OF RAIL PASSENGERS

February 2007

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16. Abstract

The threat of another major terrorist attack in the United States remains high, with the greatest danger coming from local extremists inspired by events in the Middle East. Although the United States removed the Taliban government and destroyed al Qaeda's training camps in Afghanistan, events in Europe and elsewhere have shown that the terrorist network leadership remains determined to carry out further attacks and is capable of doing so.

Therefore, the United States must systematically conduct research on terrorist strikes against transportation targets to distill lessons learned and determine the best practices for deterrence, response, and recovery. Those best practices must be taught to transportation and security professionals to provide secure surface transportation for the nation.

Studying recent incidents in Europe and Asia, along with other research, will help leaders in the United States learn valuable lessons—from preventing attacks, to response and recovery, to addressing the psychological impacts of attacks to business continuity. Timely distillations of the lessons learned and best practices developed in other countries, once distributed to law enforcement, first responders, and rail- and subway-operating transit agencies, could result in the saving of American lives.

This monograph focuses on the terrorist risks confronting public transportation in the United States—especially urban mass transit—and explores how different forms of passenger screening, and in particular, selective screening, can best be implemented to reduce those risks.

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EXECUTIVE SUMMARY

Those charged with the security of public surface transportation systems in the United States face a dilemma. The terrorist threat is unquestionably real, yet terrorist attacks remain statistically remote events. Terrorists see public transportation as an attractive target, but there have been no major attacks on surface transportation in the United States in the past 10 years. Recent terrorist attacks on public transportation systems in Madrid (2004), London (2005), and Mumbai (2006), however, are seen by other terrorists as successes to be emulated, and similar attacks on the United States have been plotted. Were an attack on public transportation in the United States to occur tomorrow, no one could claim to be surprised.

Public or mass transit systems, particularly large urban systems that use heavy and commuter rail, are attractive terrorist targets for several reasons.

First, attacks on urban mass transit create economic harm and great disruption. More than half the workers in the central city areas of New York, New Jersey, and Connecticut use public transit. Nationally, 14 million people use public transit every weekday; another 25 million use it less frequently, but regularly.[1] Disruption of the transit system brings serious economic harm to local economies, more so if it causes a decrease in tourism.

Second, the level of security in surface transportation systems is relatively low. Public transit is designed and must operate as an open system with multiple points of entry and exit. Moreover, the volume of rail and transit passengers, which is significantly higher than in air travel, precludes the imposition of anything approaching the rigorous and costly security procedures now in effect at commercial airports. The delays would be unacceptable, and the net security benefits would be slender.

Third, crowds of anonymous strangers on mass transit create a relatively easy environment in which to attack and also to escape.

Fourth, the crowded, contained environments of rail cars, buses, and tunnels make both conventional explosives and nonconventional attacks more deadly.

The pattern of recent jihadist incidents also suggests public mass transit as a probable target. About one-fifth of all jihadist attacks contemplated or executed since 9/11 have targeted urban mass transportation. The average number of people killed per bomb in the

successful attacks is relatively high, and the means for achieving these casualties are neither sophisticated nor expensive.

National terrorism alerts, specific threat information, or attacks on public transportation targets in the United States or elsewhere in the world may dictate that security be increased to prevent additional attacks, discourage copycats and pranksters, and reassure riders. In addition to ongoing efforts to improve the design of transportation facilities and increase surveillance, for example, by deploying closed-circuit television, local authorities and system operators should be prepared to rapidly increase security, even if only temporarily. This has generally been done by exhorting staff and riders to increase their vigilance and by deploying additional police and security personnel in the system. These additional security personnel may act as passive observers, or they may interact with riders, observing their behavior, engaging them in conversation, and selectively searching their carry-on luggage, backpacks, briefcases, purses, and parcels.

Various efforts have been made by federal agencies, nonprofit organizations, and transit operators to increase security.[2] The Department of Transportation (DOT) and the Federal Transit Administration (FTA) have issued useful training materials and guidelines for mass transit. The Department of Homeland Security (DHS) and its Transportation Security Administration (TSA) have also provided funds, guidance, publications, and resource centers. In 2004, TSA included mass transit in its security directives, mandating measures largely based on FTA and American Public Transportation Association (APTA) best practices,[3] including increased police officer presence, removing or hardening trash containers, video surveillance around platforms, encouraging passengers to look for suspicious behavior, and randomly inspecting passengers and packages, sometimes using canines. Many of these measures were already in place.[4] In December 2006, TSA issued a proposed rule that would require transit operators (and certain other transportation operators) to establish a 24-hour security coordinator, immediately report incidents and threats to TSA, and allow DHS/TSA personnel to test, inspect, and conduct other duties within their systems—in other words, TSA appears to be strengthening a federal regulatory system for transit security.[5]

DHS/TSA has awarded grants for planning, training, equipment, and other security enhancements; has provided direct personnel (for example, federal air marshals) to enhance security; has trained and provided canine teams (53 teams in 13 mass transit systems);[6] has inspected larger rail systems and provided law enforcement training for local authorities; has developed and tested equipment for detecting explosives and chemicals; and has conducted security assessments to define best practices and vulnerabilities.[7] Grant

programs have been initiated to assess risks, strengthen security, and bolster both security and emergency response capabilities as part of a consequence-management effort.

The Transportation Research Board (TRB) has published a number of practical studies and guidance materials on subjects ranging from emergency planning to communications, robotics devices, and exercises and drills. APTA has a vigorous program of standards development and auditing and has developed useful best practices. The Mineta Transportation Institute (MTI) has produced several useful works on transportation security.*

By and large, these efforts have focused on risk assessment; the need to create additional detection and deterrence, primarily through passive means such as surveillance and observation; and consequence management. Calls for action in Congress focus on federal funding in general and have not considered whether any kind of passenger screening could be introduced in public transit, or under what circumstances. The issue is only now being addressed, although the DHS Science and Technology Directorate (DHS/S&T) and TSA demonstrations of technology to assist in screening have been useful.

Despite the fact that TSA security directives apparently touch on random screening of bags and passengers and eight transit agencies use behavioral observation to "screen" passengers,[8] only two transit agencies have active programs of passenger screening that include inspection. Both of these programs involve partial, voluntary screening. However, interviews with transit officials suggest that most are keenly aware of the need for screening, and most believe that at some time in the future they will possibly, or even probably, have to implement a screening system that includes passenger inspections.

While screening is the most effective way to combine the essential elements of deterrence and defense, a host of factors—including resource limitations, legal constraints, and public acceptance—make transit authorities view this prospect with great trepidation. Anyone who has been through the development and implementation of airport screening knows that operators face a set of conflicting problems that can be managed but not fully solved.

*Jenkins, *Protecting Surface Transportation Systems and Patrons from Terrorist Attacks*, MTI Report 97-4, December 1997; Brian Michael Jenkins, *Protecting Public Surface Transportation Against Terrorism and Serious Crime: Continuing Research on Best Security Practices*, MTI Report 01-07, October 2001; Jenkins, *Terrorism Overview*, MTI Report 01-14, October 2001; Jenkins, *Saving City Lifelines,: Lessons Learned in the 9-11 Terrorist Attacks*, MTI Report 02-06, September 2003; Brian Taylor, *Designing and Operating Safe and Secure Transit Systems: Assessing Current Practices in the United States and Abroad*, MTI Report 04-05, November 2005.

In the case of mass transit, the only screening approach that is practical—screening less than 100 percent of all passengers—is the one the U.S. population resists the most. There is a general distrust of anything that seems intrusive and is not egalitarian, as well as dissatisfaction with any security solution that does not promise certainty of success. Until the traveling public understands security better and accepts a more realistic long-term level of risk, it will want passive security that promises full protection, equal treatment, and no delay—currently an impossible set of demands to meet.

Still, we strongly believe that maintaining the status quo is just as wrong as trying to implement a screening solution that is fundamentally incompatible with mass transit. We have, therefore, attempted to identify a screening approach that can be sustained for the long term, one that reduces risk while maintaining operational efficiency and public support.

Selective screening raises a number of questions regarding utility, effectiveness, application, workforce requirements, costs, public acceptance, even legality. This report addresses the following questions:

- If 100 percent screening is not possible, do selective searches make sense?
- If only some passengers are screened, where there is no specific intelligence, what should be the appropriate selection process?
- What combinations of selection methods are appropriate under different conditions?
- What role can current and future technology play in passenger screening?
- What are the characteristics of a good screening program?

Organization of This Monograph

We review the current terrorist threat, which suggests a challenge to security that seems almost certain to persist because attacks on public or mass transportation, urban mass transit in particular, offer terrorists a good "return on investment"; and we examine the objectives and benefits of selective passenger screening and measures of its effectiveness.

The document is organized as follows:

- The first chapter, "Scope of the Study and Definition of Terms," defines the forms of public transportation considered in the report.
- Next, "The Current Terrorist Threat" examines past jihadist attacks, modes of operation, and trends, and identifies factors that are of particular relevance to public

surface transportation generally and urban mass transit in particular. It assesses the value of urban mass transit as a jihadist target in absolute and relative terms.

- "The Objectives of Screening" specifies the goals screening should be designed (and not designed) to accomplish in the current threat environment.
- "Methods of Selecting and Screening Passengers" describes different methods of selecting and screening passengers.
- "Limitations on Passenger Screening" considers the structural, operational, legal, and public limitations on security screening, in particular, selective screening.
- "Current Practices" provides a snapshot of current security surveillance and screening practices and plans for future implementation to provide an appropriate level of security in the public transit environment.
- "Technologies for Screening in the Public-Transit Environment" briefly explores what technology can and cannot do now, and what it may be able to do in the future.
- "The Value of Selective Screening Regimes in Different Threat Situations" explores whether the screening of less than 100 percent of passengers provides value, the kinds of selection methods that are available, and the optimal mixes for different threat environments.
- "Characteristics of a Good Screening Program" points out some basic mandates for maintaining effective and professional screening.
- The final chapter, "Conclusions and Recommendations," summarizes our answers to the questions addressed in the study and presents some key recommendations for the transit industry and the government.
- This document concludes with an appendix that presents a security survey administered to transportation organizations; endnotes; abbreviations and acronyms; a bibliography; information about the monograph's authors; and an explanation of the report's peer review process.

KEY JUDGMENTS

Our conclusions and recommendations are summarized below:

- Terrorists see urban mass transportation as an attractive target—an easy means of inflicting civilian casualties, causing massive disruption, and provoking alarm. This threat will persist for years to come.
- Screening 100 percent of urban mass transit passengers is not a realistic security option. The human resources required, added security costs, and delays would destroy urban mass transit.

- Terrorism alerts, specific threat information, or attacks on surface transportation targets elsewhere may dictate that security measures be rapidly increased to prevent any further planned terrorist attacks, discourage copycats, and reassure riders. Selective screening offers a flexible response that can be implemented immediately and reduced as the threat decreases. Screening some passengers through selective searches is a viable security option.
- The goal of any security measure is risk reduction, not the prevention of all attacks. Selective searches can contribute to deterrence, oblige terrorists to take greater risks, complicate their planning, force them to use smaller amounts of explosives, and, better yet, divert them to less lucrative venues, thereby reducing casualties.
- Existing technology and the use of canine teams can facilitate security inspections, but we are still years away from full technological solutions; security will continue to be labor intensive.
- The introduction of any passenger-screening program, especially one that involves selection, runs against Americans' preference for security that is passive and egalitarian. Screening programs must be carefully planned and closely managed to reduce the inevitable allegations of discrimination or profiling based upon race or ethnicity.
- Legal challenges to selective screening should be anticipated. A recent court decision upholds selective searches, but only if they incorporate certain features.
- A good selection process must be planned in advance; must be based on clear policies and procedures; must combine random selection, behavioral profiling, and specific or general threat information; must maximize unpredictability and deterrence; must allow for program expansion, redeployment, and reduction; should use existing technology; and must maximize interaction with riders, but not in a way that is perceived as harassment.
- Vigorous public information programs that outline risk-reduction goals must accompany the introduction of any new security measure that directly engages riders, to allay potential public concerns.

SCOPE OF THE STUDY AND DEFINITION OF TERMS

This study specifically addresses the application of passenger-screening methods in public transportation, or mass transit, systems, particularly in major metropolitan areas. We begin by defining the terms used in this report.

Public transportation, or mass transit, is service operated by transit agencies or systems and provided on fixed routes, that is, with vehicles stopping to pick up passengers on a fixed schedule along a specific route and delivering them to specific locations. This study focuses primarily on urban mass transportation, because urban systems have the greatest density of passengers and therefore the highest potential for casualties in the event of an attack. We focus on heavy, light, and commuter rail service rather than buses; however, this is not to suggest that terrorists do not consider bus service to be a valuable terrorist target—experience in Israel and London shows that terrorists do target buses.[9] The following types of service are considered:

- **Heavy rail (metro, subway, rapid transit, and rapid rail)**: electric railways characterized by high speed and rapid acceleration, with passenger rail cars operating singly or in multicar trains on fixed rails; separate rights-of-way from which all other vehicular and foot traffic is excluded; sophisticated signaling; and high platform loading. (Examples: Washington Metropolitan Area Transit Authority [WMATA] and the Metropolitan Transit Administration's New York City Transit [MTA-NYCT])
- **Light rail (streetcar, tramway, and trolley)**: lightweight passenger rail cars operating singly (or in short, usually two-car, trains) on fixed rails in rights-of-way that are often not separated from other traffic, typically powered by an overhead electric line via a trolley or a pantograph. (Examples: the Santa Clara County [California] Valley Transportation Authority light rail system and the San Diego, California, trolley system)
- **Commuter rail (metropolitan rail, regional rail, or suburban rail)**: electric-or diesel-propelled railways for short-distance, urban passenger-train service between a central city and adjacent suburbs, characterized by multitrip tickets, specific station-to-station fares, railroad employment practices, and usually only one or two stations in the central business district. (Examples: Virginia Railway Express [VRE] in the Washington, DC, metropolitan area and the Long Island Railroad [LIRR] in the New York area)
- **Passenger ferry service**: service provided by vehicle ferries that have at least one deck for vehicles and additional decks for passengers, or passenger-only ferries that have only passenger decks, sometimes with space for bicycles. Although immediate blast effects

on ferries may be less lethal than blast effects in a heavy rail system, ferries carry large numbers of passengers and provide poor escape routes. They therefore represent valuable targets. (Examples: vehicle ferries in the Seattle, Washington, area that are more than 460 feet long, each accommodating 2,500 passengers and 218 vehicles, and the 310-foot, passenger-only Staten Island ferries in New York, each of which can accommodate 6,000 people)

Passenger screening is the questioning or physical examination of passengers or members of the public by employees of the transit agency in an area under the control of the transit agency. Physical examination can include passengers' clothing; articles they carry; their identification; and bags or packages they carry. We assume that no cargo is carried on the transit system separately. Searches may be done by hand or may use a technology that can detect the bulk or trace particles of an explosive; the presence of firearms or other dangerous weapons; or the presence of chemical, biological, radiological, or nuclear (CBRN) agents.

THE CURRENT TERRORIST THREAT

Although the individual passenger's risk of a terrorist attack is statistically minute, the threat to public transportation systems, especially urban rail transit, is growing. This is evidenced by the deadly attacks in Madrid (in 2004), London (in 2005), and Mumbai (in 2006). The greatest current threat comes from jihadists inspired by al Qaeda ideology.

In response to the 9/11 attacks on the World Trade Center and the Pentagon, the United States and its allies concentrated on degrading the operational capabilities of the al Qaeda terrorist organization that carried out the attacks. Al Qaeda's Taliban protectors in Afghanistan were toppled, its training camps were dispersed, its key operational planners were apprehended, and its top leadership has been kept on the run. As a consequence of unprecedented focus and cooperation among intelligence services and law enforcement agencies worldwide, many intended terrorist operations have been uncovered and thwarted.

Nevertheless, al Qaeda's leaders continue to communicate and inspire angry young men to violence. Jihadist extremists, certainly motivated by al Qaeda but not exclusively controlled by them, radicalize, recruit, indoctrinate, and instruct eager volunteers who plan, prepare, and launch terrorist operations. In the five years following 9/11, jihadists carried out more than 30 large-scale terrorist attacks, not counting any that occurred in Afghanistan, Iraq, or Israel, or in the insurgency zones of Kashmir or Russia.

Moreover, at least that many attacks have been thwarted, indicating that the jihadist enterprise is operating at a significantly higher level than it did before 9/11, although it is pursuing mostly pre-9/11 scenarios. Roughly one-fifth of the attacks, including some of the deadliest events, have been aimed at public surface transportation. The current fighting in Iraq, the escalating insurgency in Afghanistan, the "jihadization" of the long-running insurgency in Kashmir, new jihadist footholds in Somalia and elsewhere in Africa, the apparent appeal of jihadism to Muslim immigrants, sons of immigrants, and converts in European cities, as well as terrorist plots uncovered in the United States and Canada, all suggest that the jihadist global terrorist campaign will persist for years to come.

The jihadists have adapted to today's hostile operating environment. Their activities are now increasingly decentralized. Radicalization and indoctrination occur locally. Operations are planned and prepared on local initiative, with little evidence of external material assistance. This limits the resources available to the terrorists, but it puts their operations

under the radar, reducing the international communications, money transfers, frontier crossings, and other transactions that national intelligence services monitor.

Jihadist planners anticipate a conflict that will last centuries, but local jihadists plan single attacks that must succeed operationally, not long campaigns. This is particularly true of suicide attacks, where terrorists get only one chance to demonstrate their conviction, their courage, and their prowess as warriors. To succeed is to be worthy of God's support and, at the same time, to demonstrate that they have it. Failure suggests its absence and cannot be risked. This pushes the terrorists toward soft targets and reliable tactics. Their primary measure of success has become almost exclusively body count. Virtually any crowded place will do.

This quest for high body counts and soft targets that ensure tactical success makes public transportation an especially attractive target. Public transportation systems offer terrorists easy access and, for those who are not suicidal, ease of escape. Passengers are crowds of strangers, guaranteeing the attackers anonymity; the contained environments of train coaches and buses, stations, and tunnels enhance the effectiveness of both conventional explosives and unconventional weapons, thereby guaranteeing high body counts. Finally, attacks on public transportation systems cause great alarm and disruption, which is the primary objective of terrorism.

MTI's chronology of nearly a thousand attacks on surface transportation over the past four decades shows that terrorists who attack transportation, including those who came before the jihadists, are out to kill. Two-thirds of the attacks were clearly intended to cause fatalities, and 37 percent succeeded (compared with between 20 and 25 percent of terrorist attacks on all categories of targets). Multiple fatalities resulted from 75 percent of the fatal attacks; 28 percent involved 10 or more fatalities.[10] Almost every attack in the past several years has been intended to kill, and the current jihadist terrorist campaign underscores these trends (see Table 1 on page 12).

One way local jihadist terrorists with limited resources and expertise can achieve high body counts is by assembling hundreds of pounds of explosives in a vehicle and detonating it in a public place. The spectacular bombings in Bali, Jakarta, Karachi, Riyadh, and Istanbul are examples of such operations. Fifteen of the jihadists' attacks in the five years since 9/11 have involved vehicle-borne improvised explosive devices (VBIEDs). On average, these attacks killed 24 persons per bomb, with a median number of fatalities in the high twenties.

However, terrorists can easily achieve high body counts with small explosive devices (10 to 20 pounds) by detonating them on trains and subways. These operations are much cheaper than attacks in other public places—no vehicle is required and fewer explosives are needed. Operational security is also easier to maintain, and the devices are easier to construct. Finally, for terrorists who are not suicidal, escape is likely to be easy.

The "return on investment" in public-transit attacks is almost as good as that in large VBIED attacks. An analysis of the terrorist bombings of trains and subways in Stavropol (December 2003), Moscow (February 2004), Madrid (March 2003), Russia (August 2004), London (July 2005), and Mumbai (March 2003 and July 2006) shows that the 26 bombs that detonated delivered an average return of 20 fatalities each, with a median of 19—almost as good as the rate achieved by VBIEDs, for much less investment and with a much lower risk of failure.

Although the sample populations are small and the analysis is crude, these figures demonstrate a powerful operational rationale for attacks on public surface transportation, one that jihadist terrorist planners are surely aware of. They see the attacks on trains and subways in Madrid (where 191 persons were killed), London (52 killed), and Mumbai (207 killed) as successes to be emulated or surpassed.

In addition to the successful attacks, terrorists have plotted to release cyanide on New York's subways, to bomb a subway station in New York, to spread ricin on London's Heathrow Express, to attack London's subways with bombs and chemicals, to bomb train stations in Melbourne or Sydney, to blow up a commuter train in Milan, and to breach underwater subway tunnels in New York. They attempted a second bombing of London's subways and a bus in July 2005, and in August 2006, they left suitcase bombs that failed to explode on a train in Germany. Transportation targets are clearly in the jihadists' playbook.

It can happen here in the United States. In 1997, there was a plot by Islamic extremists to carry out a suicide bombing in New York's subways; in 2003, a plot to release cyanide in New York's subways; in 2004, a plot to bomb a New York subway station; and in 2006, a plot to attack trains in tunnels under the Hudson River.

Table 1 Post-9/11 Attacks on Rail and Bus Passengers

Date	Location	Description
December 2001	Singapore	Authorities arrested terrorists involved in planning attacks on various targets, including the city's metro system.
January 2003	United States	Authorities learned of a plot to release hydrogen cyanide in multiple locations on New York's subways.
March 14, 2003	India	A bomb on a Mumbai commuter train killed 10 persons.
December 5, 2003	Russia	Terrorists detonated a bomb on a train in Stavropol, killing 42 persons.
February 6, 2004	Russia	Terrorists detonated a bomb in Moscow's metro, killing 49 persons.
March 11, 2004	Spain	Ten bombs exploded on the Madrid commuter transit system, killing 191 persons and wounding approximately 1,900. A jihadist terrorist group claimed responsibility.
August 27, 2004	United States	New York police thwarted a plot by Islamic extremists to bomb the subway station in midtown Manhattan.
August 31, 2004	Russia	Terrorists detonated a bomb in Moscow's metro, killing 10 persons.
April 17, 2005	United Kingdom	Authorities revealed that al Qaeda-trained terrorists planned to place ricin on the handrails and in the lavatories of the Heathrow Express.
July 7, 2005	United Kingdom	Suicide bombers set off three bombs on trains in London's underground tube and one on a London bus, killing 52 persons and wounding more than 700. The attackers claimed association with al Qaeda.
July 21, 2005	United Kingdom	In an apparent effort to duplicate the July 7 attack, jihadists set off three bombs in London's tube and one on a London bus. The devices failed to detonate.
August 2005	United Kingdom	British authorities reported thwarting a terrorist plot begun in 2004 to release deadly chemicals at the Houses of Parliament or in the London tube.
November 2005	Australia	Authorities arrested terrorists planning to attack a number of targets, including train stations in Melbourne or Sydney.
March 7, 2006	India	Terrorists detonated two bombs at a train station in Varanasi, killing at least 15 persons.
April 2006	Italy	Authorities discovered a terrorist plot to blow up a commuter train in Milan.
July 2006	United States	Authorities uncovered a plot to blow up subway tunnels beneath the Hudson River in New York.

Table 1 Post-9/11 Attacks on Rail and Bus Passengers (Continued)

Date	Location	Description
July 11, 2006	India	Terrorists planted seven bombs on trains in Mumbai's metro system, killing 209 people and wounding more than 700. A jihadist extremist group claimed responsibility.
July 31–August 1, 2006	Germany	An unexploded suitcase bomb was discovered on a double-decker commuter train in Dortmund. A second unexploded bomb was discovered at a railway station in Koblenz. Police subsequently arrested two Lebanese men suspected of involvement.

THE OBJECTIVES OF SCREENING

Defining the objective of screening would seem simple: To prevent any kind of attack. By that definition, however, almost all defensive measures will fail. Nevertheless, screening in urban mass transit, while it will fall short of absolute prevention, can achieve useful and realistic goals. It may deter an attack from being planned altogether. It may divert attacks to targets of lesser value. It can complicate operational planning. It can provide law enforcement with greater opportunities for interception. Finally, it may force attackers to alter their plans at the last moment, reducing their chances of success or the lethality of their attack.

To deter an attack altogether or divert it to another target is no small accomplishment. Ultimately, the terrorist is driven to venues or devices that will produce fewer casualties and will have less economic impact.

Complicating the terrorists' operational planning is a reasonable goal. If conspirators have to lengthen their planning cycle and conduct more surveillance, there will be more opportunities for authorities to intercept them.

Not all terrorist operations are suicide, or "martyrdom," operations. The conspirators in the Madrid and Mumbai bombings hoped to escape. It is easier to recruit terrorists who believe they have a reasonable chance of escaping than to recruit people who are committed to dying in the process. There were 13 bombers in Madrid and only 4 in London. Fewer bombs meant fewer casualties—191 compared with 52.

In other words, the effectiveness of screening should not be measured only by the weapons, explosives, or attackers actually stopped. Finding weapons, bombs, prohibited items, or suspicious passengers is important, but it cannot be the only objective of screening or the sole criterion of effectiveness.

U.S. aviation history provides several examples of attacks redefined and deferred by security measures. Unfortunately, the details of examples remain classified. An unclassified example comes from the January–March 1995 attempt of Middle Eastern terrorists to place bombs on as many as 11 wide-bodied aircraft bound for the United States from Asian airports. Ramzi Ahmed Yousef, the organizer of that plot, who also masterminded the first attempt to bring down the World Trade Center towers in New York City, had researched developments in explosives-detection technology. He had determined—erroneously—that U.S. airliners might at that time be using effective technologies in their screening of

passengers and cabin baggage that were relevant to certain components of the device he was constructing. Apparently because of this fortunate misunderstanding, Yousef decided to use a homemade alternative. The terrorists' insufficient care in making the extremely unstable homemade devices caused a fire in their Manila apartment, which led to the discovery and disruption of the plot.

Failing to find anything does not mean the system is not working. Equally important, missing something also does not mean the system is not working, particularly if the screening function is determined, in the aftermath of an attack, to have reduced the attack's lethality.

If risk reduction, rather than risk elimination, is the objective, it is also true that where 100 percent passenger screening is not possible—as is currently the case in mass transit—programs involving partial and voluntary screening can still have value, particularly if they are managed properly to maximize their deterrent and detection benefits.

This can be demonstrated by two examples. First, in the voluntary screening regimes used by transit operators in New York and New Jersey, passengers can choose not to submit to screening. They are not allowed to board at the station where the screening was refused, but they can leave and board at another one. While at first glance this may seem nonsensical, it is not if one assumes—as we have every reason to do—that trained officers, both uniformed and plainclothes, are observing all passengers entering the screening process and particularly those electing to refuse it. Thus, voluntary screening systems have considerable value. Second, if the screening location is randomly shifted from one station to another, and if the selection of passengers is difficult to predict, deterrence is significantly increased. Unless the decision to determine where screening operations will take place or how passengers are selected is known or can be determined by observation, this complicates potential attackers' operational planning.

A screening regime that will be in place for a relatively long period of time will also have to meet other, secondary objectives that are directly related to the goal of risk reduction. The regime must be kept at a high level of professionalism and effectiveness, which is difficult in the gritty real world of managing both normal operational personnel and security personnel. Being explicit about what the screening is and is not designed to do, having operational procedures that are followed, and being interactive and courteous with passengers are vitally important from the standpoint of withstanding legal challenges and minimizing negative public reaction. To the extent that either current technology or canine units are used to augment the search of selectees or their packages, understanding

the complexity of the interface between operator and technology and maintaining quality control and resolution protocols are also key. We explore many of these features in "Characteristics of a Good Screening Program" beginning on page 53.

It is important to acknowledge that situations of increased threat often are not identified by specific intelligence. In a perfect world, the various sources of intelligence would be able to track all terrorist operatives. If security intervention were needed at all, it would be covert and invisible to the passenger, because the identities of the attackers would be well known. In reality, information about most threats, even under the best of circumstances, is fragmented, incomplete, and uncertain as to either location, timing, type, or number of attacks. More worrisome, the homegrown nature of the London and Madrid conspiracies, along with the relatively short period of time from conception to execution of the attacks, suggests that the chances of timely intelligence alerts are not great. In short, those responsible for security measures—screening among them—may get no warning.

METHODS OF SELECTING AND SCREENING PASSENGERS

100 PERCENT SCREENING

Although the U.S. air passenger transportation system has been criticized for having security gaps involving cargo and ground-service personnel such as catering company employees, aviation security authorities have put in place a system in which every passenger, employee, or object that enters the aircraft, the sterile area, or the Secure Identification Display Area (SIDA) on the tarmac is physically screened or has had relevant paperwork or data examined. Before the first security screening was implemented in the 1960s, commercial aviation was as vulnerable to security threats as mass transit is now.

However, commercial aviation was inherently more restricted. Before the inevitable call for similar screening of transit systems is made, it is important to clarify how the aviation system differs from the more complex public-transit systems.

By design, commercial aircraft have few entry points. This is clearly not true for trains used in urban mass transit. Furthermore, because people have been killed on the tarmac by vehicles, or by walking into propellers, or being ingested into jet turbines, procedures to keep passengers away from commercial aircraft have always been in place. By contrast, mass transit is designed so that the public can be within feet of train or bus doors. The physical configuration of mass transit is entirely different from that of commercial aviation.

Both aviation and mass transit depend on reliable and frequent departures and arrivals, but the difference in passenger volume is staggering. According to APTA, New York's Penn Station alone handles the same number of passengers during each morning's peak hours as Chicago's O'Hare International Airport handles in 60 hours.[11] The highest peak passenger load is in New York, on the Lexington Avenue Express and Local trains. These two routes alone are used by 63,200 passengers an hour traveling in the main rush-hour direction; the highest rate for any 15-minute period in that hour is slightly over 15,000 passengers.[12] By contrast, an average of 210,000 passengers per day pass through O'Hare,[13] only 3.32 times the number the two train lines experience per hour in just one direction.

In short, the throughput demands at screening points at airports are already challenging, but the challenge would be hundreds of times greater at major ground transit stations, especially at peak hours. A lengthy screening process could generate crowds that themselves could become prime targets for suicide bombers seeking mass casualties.[14]

It is, therefore, essential to understand the methods of performing selective searches, that is, screening in which not all passengers are searched.

RANDOM SCREENING

In random selective screening, passengers or luggage to be screened are selected by random methodology. Such screening can probably best be explained in the negative: passengers are not selected on the basis of behavior, clothing, or attitude; on the basis of apparent nationality, race, or gender; or on the basis of identification or personal documentation. Neither is the selection based on patterns such as time of boarding, origin, or destination, or anything about the travel itself. The selection is mathematically random and, therefore, unpredictable.

There are many ways of generating random selections. The simplest would be to select every tenth or twentieth passenger, but this has the obvious disadvantage of allowing anyone monitoring to figure out the sequence unless it is changed frequently enough to avoid useful prediction. A handheld computer can randomly generate a number between 0 and 999 for each passenger, and those whose number is less than, say, 30 can be selected to ensure that a given percentage of passengers are screened. Various information carried in the reservation system or on the ticket also could be used.

Unpredictability and verifiable independence of the selection from anything about the passenger and his or her travel are the key features of random screening. These features can be important in sustaining legal approval and countering charges of racial profiling.

SELECTIVE SCREENING

Selective screening is the inverse of random screening. In selective screening, certain factors are considered to be indicative of a possible attacker and, therefore, increase the likelihood of a search. Jocelyn Waite provides a good description of selective screening, sometimes referred to as profiling, in her excellent article "The Case for Searches on Public Transportation":

> Profiling can distinguish by behavior (e.g., buying a one-way airline ticket); a combination of behavior and appearance (e.g., wearing a large loose overcoat in weather not calling for overcoats); or appearance alone (apparent racial or ethnic identity). Singling out particular types of clothing (that is,

> clothing that could conceal weapons or explosives) or particular sizes of packages (those that could conceal weapons or explosives) could be deemed profiling and could be used to target security screening. However, the term "profiling" most commonly calls to mind racial or ethnic profiling, which has given rise to considerable controversy. It should be noted that the use of racial classifications are [sic] not per se unconstitutional, but [they] are subject to strict scrutiny to justify them.[15]

Behavior and Appearance

Behavior and appearance can be related and are often examined together. Many countries have developed sophisticated and continuously evolving behavioral profiles and associated training regimes that help observant personnel detect certain behaviors. The behaviors can include *attitudes* such as hesitancy; *body language* such as avoiding eye contact or being in a trancelike state; *behavior in crowds* such as trying not to call attention to oneself; and *reacting to police or uniformed personnel* by avoiding eye contact with them or avoiding where they are. When combined with certain clothing—bulky jackets that could hide a suicide belt—or bags of a certain size, they can provide trained officers with reason to select an individual for search.[16]

Officers or employees with long experience in a particular transit setting often develop a sixth sense that something is wrong or out of place. This enables them, for example, to quickly distinguish between a mentally deranged person or someone anxious not to be late for a connection or meeting and someone who might be placing or about to explode a device. Trained officers can also question such people and interpret whether their responses warrant suspicion. Nevertheless, identifying potentially dangerous individuals on the basis of behavior, clothing, or baggage is quite difficult.

Baggage Type

Certain kinds of clothing or bags can conceal weapons or explosives. Where specific threat information about a weapon or device is available, passengers could be selected for screening on the basis of the size or type of bag or parcel they are carrying.

Gender and Ethnicity

While selection solely on the basis of gender or ethnicity is prohibited and can be ineffective as a security measure, case law indicates that it is permissible to consider certain factors.[17] Authorities who have reliable intelligence that attackers are most likely to be

males appearing to be from Southwest Asia or North Africa would be foolish not to focus on individuals fitting this description for as long as the intelligence information remains valid.

Ticket, Method of Purchase, and Identification

For public surface transportation, screening based on the method of ticket purchase or purchaser identification is currently mostly theoretical. There is no requirement to show identification to use mass transit. A large and growing percentage of tickets are purchased without any interface with a station agent. Many people purchase tokens and magnetically encoded tickets through machines, and larger transit systems now use smart cards, which are purchased for multiple trips (on both rail and bus) and require interface only with a card reader in the entrance lane. While some smart cards are purchased online with credit-card numbers, addresses, or other personal information, this will not become the dominant means of purchasing tickets for a long time, and will never be the only means. In addition, there will be significant legal constraints on the use of information entered in order to purchase a smart card. While such information could be required or used in the future, this seems remote and costly at the moment.[18]

Other Factors

In addition to the method of selection, other factors, such as the following, may determine the deployment and intensity of searches:

- *Time and route of travel*. Selective screening can focus on routes and stations that are the most central to the system and through which the greatest number of people travel. Both the Madrid and London bombings took place during the rush hour, and although the terrorists initially entered at other stations, the attacks focused on central stations and trains at times of peak capacity. Locations where evacuation or access by emergency personnel are the most difficult—including trains between stations—could also be factors in deploying searches. Countering an attack that might involve chemical, biological, radiological, and nuclear (CBRN) weapons would entail different considerations, including a focus on places where air circulation could reach the greatest number of people.
- *Proximity to a target with high symbolic value*. Although the primary objective of jihadist attacks is mass casualties, a secondary objective is to destroy or damage assets of symbolic value. Stations that are close to national landmarks, particularly those viewed by jihadists as symbolic of Western power or decadence, may require additional security.

TECHNOLOGICAL SCREENING

The experience in aviation suggests that where 100 percent screening is not feasible, technology can help determine whom to screen (or to screen more intensively) if it is properly implemented. Explosives can be detected either by their bulk composition or by the presence of particles attached to a surface or released into the air—so-called explosive traces. Relatively few bomb makers are skilled enough to not leave such traces on their clothing, documents, persons, or baggage. The relatively large amounts of explosives needed to constitute a serious threat in the transit environment compared to the amounts needed for attacks on commercial aviation also make the use of bulk detection devices highly feasible.

There is no technological method for screening all mass transit passengers as is done in airports, and the development and deployment of technologies suitable for screening passengers in a rail environment for explosives at standoff distances of 10 meters or more is many years off. However, using technology to search those selected more effectively by some other means holds out some intriguing possibilities, if only because the amounts of explosives used in the London and Madrid bombs were 10 to 20 times the amounts that can bring down a pressurized airliner and are thus relatively easy to detect, even in the "dirtier," more cluttered, fast-moving environment of mass transit.

CANINE (K-9) TEAMS

Well-trained canine teams are available now and could be considered an effective "technology." Subject to proper quality controls and training and used for short periods of time, a well-functioning and alert canine team can be effective at detecting particles and vapors of explosives. The dogs have the unique ability to follow the vapor to its source and therefore hold considerable promise for examining suspicious or unaccompanied bags and for searching areas after an alert. If trained to focus on people in a transit environment rather than objects, they can also help screen passengers. However, "the potential benefits of K-9 deployment will not be achieved in the transportation environment unless management actively attempts to understand what will be gained from the K-9 unit and how its performance can be measured."[19] Public and handler response to canines is generally positive and can mask the significant challenges of ensuring solid initial and recurrent training and acceptable detection, particularly since most search dogs cannot function accurately for more than 30 minutes at a time. This factor suggests that the only canine approach to 100 percent screening would be to rotate large numbers of search dogs

trained specifically to focus on moving people in a transit environment, which could entail many complications and costs.

Threat Information and Racial Profiling

No practice or concept has been more controversial than racial profiling, nor have allegations of any other practice rightfully brought more screening systems to their knees. Racial profiling can be defined as selecting certain passengers for screening based solely on their race, presumed national origin, ethnicity, or religion, or the use of a selection method that effectively guarantees that only people with the same physical characteristics are screened. This practice strikes at the heart of civil rights protections, and although race may be considered when there is specific supporting threat information, transportation operators must be extremely careful here.

Racial profiling unrelated to specific threat information is unacceptable and can be counterproductive. Unless there is reliable information that only certain populations, defined in national or racial terms, are the likely attackers, selections can divert attention away from passengers who may be exhibiting traits or behaviors that are far more directly linked to the actual threat. As the jihadist enterprise acquires more converts, certain things become less certain. Converts to the cause who are not from Southwest Asia, North Africa, or the Middle East have been used for some missions specifically because they do not fit stereotypical racial profiles.

The most common denominator among recent attackers is that they tend to be young men who have become immersed in and converted to a jihadist worldview. If today's terrorism is primarily motivated by ideological conviction, the diversity of attackers is likely to increase, not decrease.

Terrorist groups can often find people to carry out attacks who do not fit known profiles or who may be disguised. According to Bruce Hoffman of the RAND Corporation, "Sometimes the bombers disguise themselves: male *shaheed* (Arabic for 'martyrs') have worn green Israeli Defense Forces (IDF) fatigues; have dressed as *haredim* (ultra-Orthodox Jews), complete with yarmulkes and *tzitzit*, the fringes that devout Jews display as part of their everyday clothing; or have donned long-haired wigs in an effort to look like hip Israelis rather than threatening Arabs. A few women have tried to camouflage bombs by strapping them to their stomachs to fake pregnancy.[20] The bottom line is that racial or

ethnic profiling not tied to threat information is not only illegal and unsustainable, it can be tragically ineffective as well.

At the opposite extreme is the situation in which specific threat information is learned about an impending attack, not in time to interdict the individuals or the terrorist cell, but specific enough to know what to look for. In this case, screening would be time-limited and could include any number of factors, including the number of attackers, their age, their gender, their clothing, their appearance, their national origin, what they may be carrying, and when and where they might be traveling. Factors of race can legally be included in such searches because they are specifically tied to threat information.

LIMITATIONS ON PASSENGER SCREENING

In addition to the physical and operational limitations on passenger screening discussed in the previous chapter, there are other equally important constraints.

The first is resources. Whether technology is available or not, screening is workforce intensive. Transit security chiefs interviewed in this study could not provide estimates of how many work-hours would be required to maintain a screening function, in part because no practical screening concept has been defined by many transit agencies. However, most transit agencies indicated that they were not capable of sustaining any kind of screening function for more than a few weeks without augmentation from other authorities.

The other two major limitations are legal authority and public support. Passenger screening will confront a difficult political environment. Advocates of civil liberties will challenge screening on the grounds of guarding individual rights against warrantless and unreasonable searches, seeing themselves as part of the checks and balances needed to preserve democracy. Legal challenges are more likely if there is little public and passenger support for screening.

The constitutional and precedented authority for conducting passenger screening has been examined in Jocelyn Waite's excellent article, which summarizes the legal constraints any transit authority must consider when instituting the kind of administrative search regime that generally has been held to be constitutional. She emphasizes the need for such a regime to be carefully thought out and controlled:

> An administrative search must be conducted as part of a general regulatory scheme (although a regulation per se may not be necessary) that furthers an administrative purpose, rather than furthering criminal investigation. A warrant is not required where it would frustrate the governmental purpose behind the search. The search derives its legitimacy from governmental authorization, not consent to search. The court will balance these factors: the need to search, which should promote a substantial government interest (e.g., search for explosives and weapons prior to boarding aircraft), against the invasion that the search entails. The scope of the search is limited to furthering the administrative need. At least some courts will invalidate such a search notwithstanding a legitimate government interest if there is also an impermissible motive. The search must have a nondiscretionary application.

> Both notice and methodology will affect the assessment of the intrusiveness of the search.[21]

Waite continues:

> Although the law on transit security searches is still emerging, transit agencies may look to established case law on suspicionless searches for guidance. Legal authority on checkpoints, special needs, and general administrative searches will provide useful insight into the requirements for constitutional screening policies. Cases on airport security and sensitive area entry screening should prove particularly relevant.

For passengers, security measures constitute a tradeoff between risk and inconvenience, delay, and intrusiveness. Immediately following a terrorist attack on a similar transportation system or upon receipt of credibly communicated intelligence information of an impending attack, the objectives of reduced risk and increased safety will outweigh inconvenience. As information about the threat diminishes or if the attack is geographically distant, public support for screening, particularly screening that is viewed as intrusive or unprofessional, will diminish.

Other factors may also contribute to the decline of public support for security searches. Seven months after 9/11, Harvard University surveyed law students (including some minority students) about their reactions to different kinds of aviation screening situations.[22] The survey found that support for selective screening that targets a particular group for more intensive screening rather than affecting all passengers increases considerably with the level of delay imposed on all passengers. In other words, the prospect of delays for all passengers increase support for selective searching. When a delay of 10 minutes in the system was proposed, 44.7 percent favored targeting screening on a particular group; when the delay was increased to an hour, the percentage increased to 73.9 percent. The study also found that majority populations (whites) are more willing to accept profiling focused on them if it results in less wait for others, whereas minority populations showed less support for screening focused on them and were relatively insensitive to the decrease in delays for others.

Perhaps the most interesting conclusion of the Harvard study was that the sensitivity to perceived terrorist risk varies considerably among individuals and is not rationally related to specific probabilities that risk will be reduced by a given percentage. The only screening regime that garnered strong support was the 100 percent regime:

> Whether the terrorism risk is reduced to 50% of its current level, [to] 1 in 1 million per flight, or 1 in 10 million per flight, or zero, is not significantly different. Indeed, a regression analysis [of the delays that the respondents were willing to accept] does not differ significantly across three scenarios in which risk is reduced but not to zero. *Doing something about terrorism risks that is incomplete but beneficial has a fairly similar attractiveness across these three options. However, a policy that would completely eliminate the risk is much more attractive and commands a much higher willingness-to-pay value*.[23] (Emphasis added)

In short, inconvenience and delay are fully accepted only when the security system causing them promises absolute safety. Since no security system can guarantee absolute safety—and screening in transit most definitely cannot—this is a problem. The U.S. public expects egalitarian treatment of all, and some population groups—in particular, ethnic minorities with a history justifying suspicion of governmental action—become deeply resentful of selective security procedures. To garner support for such procedures, a carefully thought out campaign of public and passenger education, along with outreach to various communities that takes fully into account the unique aspects of each locality, is essential.

There is a well-known phenomenon in the U.S. governmental system regarding security: The higher the official making a statement about security systems, the greater the temptation to promise 100 percent safety. This is a fatal error, as politically tempting as it may be. Without divulging information that could undermine detection and deterrence, the public information arms of transit authorities should speak about increases in security, not the absence of risk, about work in progress, not a solution. It is more important to maintain credibility for the long term—and it will likely be a long term—than to gain short-term support. Such claims also unnecessarily invite, and then increase, the negative consequences of the inevitable testing of security system effectiveness by the media.

CURRENT PRACTICES

To assess the current state of security in general and screening procedures or plans in particular, MTI's National Transportation Security Center sent a questionnaire[24] to eight transit operators chosen because they are representative of transit systems and active in the field of security. Most of the respondents were candid, although one or two appeared to be trying to put the best face on the difficult situation they were responsible for managing.

Because of time and budgetary constraints, site visits were not made to verify the information provided. Nevertheless, the responses provide an informative outline of security surveillance and screening practices in place now and plans for future implementations; current resources and constraints; and prevailing concepts about the challenges of providing an appropriate level of security in a public-transit environment. The responses are generally consistent with the Government Accountability Office's (GAO's) January 18, 2007, report on passenger rail security.[25]

General Observations about Attitudes Toward Security and Passenger Screening

All respondents implicitly or explicitly consider U.S. public transit to be a possible or likely terrorist target; some seem to believe an attack is a matter of *when* rather than *if*. There seems to be a general recognition that requirements for system openness create vulnerabilities that terrorists could exploit to achieve mass casualties and spectacular results, using relatively unsophisticated techniques.

Nearly all respondents view passenger screening—which a few prefer to define as "baggage screening" because of sensitivities to the physical searches of people and to profiling generally—as either necessary now or likely to be needed in response to future attacks on transit systems or credible threats. All view any scheme of 100 percent passenger screening as completely incompatible with the speed and openness needed by transit systems to meet basic operational requirements. Nevertheless, one transit system does plan to search all bags if threat conditions elevate to the Red level.

All the respondents consider the primary limiting factors to be a combination of legal liability, perceived resistance by the public or by general management anticipating public reaction, and availability of human resources (law enforcement officers). The combinations

of these factors differed among respondents, revealing two geographical divides: distance from the site of New York's World Trade Center, and distance from the East Coast:

- For New Jersey and New York, which already have conducted and continue to conduct passenger inspection or screening, the primary limitations are resources, especially now that the New York City screening system has been upheld by the courts; the legality of Boston's system was affirmed during the 2004 Democratic National Convention.
- For two East Coast and two West Coast transit agencies, public and general management reactions weigh more heavily. Recent court rulings have provided more certainty on the legality of a search regime in a public-transit environment.
- Two West Coast agencies are taking many good proactive measures in community policing and involving the public, but both comprehensive planning and implementation lag. Resource limitations and, more important, hesitation on the part of local authorities based on anticipated negative reactions by the public seem to be the major constraining factors. The population of the western United States seems to be less sensitized to terrorist threats in general or to the possibility of terrorist attacks on transportation systems.

All respondents desire closer links with federal intelligence agencies; many have developed informal channels that have been more satisfactory in terms of timeliness and quality than the official channels. At the same time, some fear a mandate to increase measures based on vague and nonspecific information, leaving them with the dilemma of having to increase security but subsequently not knowing when to step measures down—always a difficult decision. Several complained about receiving vague warnings without specifics from federal agencies on Friday afternoons.

All the transit operators desire practical solutions that can work in their environments. Recent efforts by TSA to collaborate are welcomed, but the relatively small amount of federal resources spent on public transit, the fear of TSA issuing future directives that are seen as impractical or that are confusingly worded for transit environments, and the numerous surveys and studies by officials who seem unfamiliar with transit or with the security dilemmas facing local transit security officials were each cited enough times to suggest some dissatisfaction with the state of federal government leadership and assistance.

Many expressed considerable confidence in a relatively robust network of information sharing among transit security chiefs, organized through APTA's Committee on Public Safety and other industry mechanisms. Programs that incorporate transit experience in their development and that are then tried and adjusted by multiple agencies become de facto industry best practices and are often copied. The repetitive use of training modules

developed by the National Transit Institute and the use of the Behavioral Assessment Screening System (BASS), or a derivative of that method, are good examples.[26] Frequent comments on the implications of the appeals court decision on the American Civil Liberties Union (ACLU) lawsuit against New York is another example—if one transit program has passed legal muster, it will most likely become a de facto standard, or at least the starting point for a legal variation. Any effort to create and improve a passenger screening regime will benefit from using this homegrown network of development and implementation, assisted where possible by TSA and other government agencies through funding and technology trials.

Nearly all respondents expressed a strong desire to see technology developed that can screen large numbers of passengers effectively without requiring interventions with individual passengers and the resulting lines such interventions create, except when the presence of an explosive or suspicious behavior providing probable cause has already been identified. Most want to see more research and development (R&D) resources put into developing such technology and more spending by TSA on transit security overall.

At the same time, most have an unrealistic expectation of when such technology could be deployed; a few articulated the desire for a system in the near term that combines explosives detection with CBRN detection, something that will be even more difficult to achieve.

Attitudes differ. Some believe from past experience and their own gut reaction that a terrorist attack is wholly probable. They "lean forward," look for solutions, and fervently worry about the future. They know passenger screening is or will be essential; they already have programs in place or want to have them, and they are always looking for ways to make security programs more robust. Other transit officials are less aggressive.

The State of Policies and Planning for Screening

Several agencies have written passenger-screening policies (one agency provided a copy), some of which contain relatively robust operational procedures for maintaining an administrative search regime. Others say they are working on such polices but do not yet have them ready. Policies and procedures that have already survived court challenge would most likely heavily influence, or provide a starting point for, these transit agencies, although unique political or operational environments also come into play.

Responses regarding contingency planning varied widely. Most agencies have relatively robust written plans; others alluded to general concepts or stated that they are working on them now.

RESOURCES

Law Enforcement Officers

Law enforcement presence is viewed as essential for reassuring the public, providing deterrence, and carrying out search operations. The numbers of law enforcement officers in the transit systems vary from a total of 3,000 in one large city to 25 in one of the smaller systems surveyed. Ratios of officers to passengers also vary. One transit agency indicated that the ratio of officers to passengers in a major system was 1 to 1,500, whereas it is 1 to 73,500 in their own system.

For emergency or surge security operations, all systems rely on current or future augmentation from local police departments, state law enforcement agencies, or, in some cases, federal agencies. These arrangements range from the simple to the robust. One agency has trained 400 state troopers and is training another 700.

Nearly all systems have some undercover presence in their force, but they differ in their views about the desirable level and the usefulness of undercover officers. In many systems, these officers are also used to deal with crimes unrelated to terrorism, such as theft, assault, and fare avoidance.

- In New York, plainclothes officers observe the random screening process, using behavioral profiling techniques designed to detect both surveillance by possible adversaries and actual attack activities. A high value is placed on police knowing the environment they work in so that they can more easily detect or sense when something is out of the ordinary. New York officials went so far as to suggest that random screening's real value, in addition to the deterrence it provides, is in provoking a reaction in passengers that can be observed and studied. Those responding abnormally or avoiding voluntary screening are particularly monitored.
- In two other systems, the importance of plainclothes officers was downplayed because they were not seen as providing any deterrent value.

All the security chiefs surveyed believe strongly that there are two ways to maximize the security effectiveness of their police forces: using community policing, that is, active

interaction with passengers and the public, and applying massive, visible forces in stations and on trains chosen at random. Both practices seem to be excellent force multipliers.

- All the chiefs expressed a strong belief in community policing. The most aggressive approaches were espoused by Los Angeles and New Jersey, where police officers are trained to interact with as many members of the public as possible; in New Jersey, they engage the public within three blocks of each station after surges.
- New York and New Jersey make the most aggressive use of the "deterrent surges" concept. New York's "Operational Sentinel" and the parallel use of "Hercules teams" by the New York Police Department (NYPD) are based on the Israeli pop-up philosophy, in which heavily armed police officers and canine teams inundate stations chosen at random. Other systems apply the same approach, but in more limited fashion because of resource constraints. The remaining agencies would like to apply this approach, but they seem to be even more resource constrained.

Trained Staff

All transit agencies have attempted to maximize the use of their existing staff to increase their ability to deter or detect terrorist attacks. In some cases, station agents or fare collectors have been trained to move outside their booths and engage passengers in conversation. In other cases, the duties of fare enforcers have been expanded to include being on the alert for suspicious behavior or packages. In many systems, administrative staffs would be deployed in an emergency to increase manpower in the system. In some systems, unarmed transit staffs are highly visible on the platforms, in distinct uniforms, engaging actively with passengers and watching for suspicious behavior.

Public Participation

All transit chiefs viewed passenger involvement as key, for two reasons: First, passengers are much more likely to notice suspicious packages and suspicious behavior, such as terrorists engaging in countersecurity surveillance or initiating an actual attempt. Second, engaging the public encourages a sense of security. Some security chiefs want to train passengers on how to evacuate in the event of an emergency, whether a terrorist attack or some other event.

Public participation programs, the most common of which is called "see something, say something," include frequent public announcements on trains and buses and in stations, along with billboards, pamphlets, and other written materials, some of which are particularly creative.

Public reaction has been generally positive. There is probably a direct correlation between the positive reaction of the public and the time lag since the most recent terrorist event or threat, whether or not it involved transit. In at least one instance, passengers reported suspicious activity that was simultaneously reported by transit employees. The suspicious behavior was countersecurity surveillance, which was reported to federal law enforcement agencies and corresponded to similar activity taking place in other systems.

Training Regimes for Passenger Surveillance and Screening

The BASS training was first tested at Boston's Logan airport by TSA. A variation of BASS, known as the Screening of Passengers by Observation Technique (SPOT), was developed and then implemented by TSA. Other agencies developed systems that predated BASS but used the same basic techniques. This training, which involves an initial multiday training course followed by one day of recurrent training each year, has become a de facto industry standard.

Two agencies indicated that they would be making BASS more aggressive with the help of Israeli or Israeli-trained experts.

The National Transit Institute's Terrorist Activity Recognition and Reaction program seems to have become another de facto standard. Designed to help transit employees identify the behavioral signs that might indicate surveillance or attack operations and the steps to take when such activity is observed, the initial training takes less than a day, and the recurrent training takes several hours.

Common to both training regimes is an explicit rejection of racial or ethnic profiling as being both unlawful and ineffective. However, many transit officials stated that intelligence-based determinations to focus on passengers by gender, age, or apparent ethnicity would be effective and appropriate under certain circumstances, although such screening would need to be monitored carefully.

Current Passenger Search Procedures and Contingency Plans

Only New York and New Jersey currently have actual passenger-screening regimes in place. Boston instituted such a regime during the Democratic National Convention in 2004 but has not reinstituted it.[27]

The New York and New Jersey search programs are characterized by the following:

- Both programs use a random selection method, but police officers can use their behavioral recognition training to select passengers in addition to those chosen randomly.
- Stations that are high-value targets, either because of high passenger volume, name recognition, or location under or near prominent sites, are preferred for conducting searches. Screening in these stations can capture the most people without causing unnecessary congestion.
- Passenger baggage is inspected or searched, not passengers. The search is conducted with explosives trace detection (ETD) devices or by canine units. Although they were not mentioned, hand searches are presumably used as well.
- The search is voluntary; passengers can choose to forgo the search, but those who do so cannot enter the system at that point.
- The key to system effectiveness is the presence of officers (including undercover officers) who observe the behavior of the passengers, particularly those who obviously avoid or refuse to undergo screening.
- The stations where screening takes place are chosen at random and without announcement, to create additional deterrence.
- Public reaction to screening has been generally positive. New Jersey reports very positive responses to baggage searches.
- New York, New Jersey, and Boston all have written procedures established.

One location that has no search program recently acquired explosives canine teams trained to sniff the vapor trails of passengers arriving at its two main stations. The program is in its infancy, but passenger reaction thus far has been positive.

Other transit agencies indicated that, if necessary, they would implement a program based on those in New York and Boston. The search program would be random, voluntary, and announced ahead of time; passenger reaction would be monitored; screening would be done by hand, by canine teams, or by explosives trace units; search stations would be set up in an unpredictable fashion to maximize deterrent value. All the transit agencies examined in this study would utilize BASS or BASS-type training for officers. All are concerned with ensuring that the legal authority to conduct searches is solid, and one was concerned that officers themselves incur no personal liability for conducting searches. The extent to which the logistics of managing screening at main stations in peak periods has been thought through is unclear.

Most important, all agencies would prefer to have more specific intelligence to use when conducting searches, intelligence that better describes the explosives and the method used

to secrete them or the identity of the attackers. In one case, a transit agency indicated that specific intelligence had in fact guided officers in attempting to detect terrorist surveillance.

The choice of locations for conducting screening was generally consistent. In addition to ensuring some kind of unpredictability in screening locations, all wished to include the following factors:

- Stations and times at which passenger loads are the highest.
- Stations that are themselves, or are located next to, sites of national significance, such as Times Square in New York or Universal City (with its theme park and City Walk) in Los Angeles.
- Smaller stations where attackers might enter the system (as they did in Madrid).
- Times other than rush hour, especially after the recent attacks in India that were timed outside of morning or evening rush hours.

Transit systems appear to be able to sustain increased screening and surveillance without significant additional resources for about two weeks to one month. Beyond this time, available law enforcement and staff will become exhausted, and help from federal, state, or other local authorities will be needed. The most commonly cited sources of support were local city and county police departments, state police, the National Guard, and in two cases, TSA. At this time, there are no firm estimates of the amount of time that a strengthened screening regime could be sustained or what that screening regime would constitute.

The Role of Screening after an Attack or Specific Intelligence Indicating an Attack

Probably the most difficult question for respondents to answer was, If there was an attack on your system or a neighboring system, or specific and credible intelligence were received that such an attack were imminent, what security measures would you immediately implement, and specifically, what role would a screening regime take?

All respondents stated that their first step would be to close the system and search it (particularly with canine teams); they would then reopen it, possibly slowly. All acknowledged that they would have to deploy a significantly increased police presence at this point and probably would institute a screening regime.

However, planning as to where resources would be required, how they would be used, and how long they would be needed seemed hazy, except at those agencies that already have instituted a regime. The most common response was that planning was in progress and that some kind of random screening would take place, possibly combined with the closure of some stations.

As indicated earlier, many respondents expressed great concern about intelligence-based ramp-ups in security measures that do not include any logical sequence for reduction in intensity. The need to share more specifics of intelligence, now and in the future, was a strong and understandable thread throughout the interviews. New Jersey was the only authority that had a program in place to ensure that screening procedures were effective and being carried out as written. The lack of an evaluation program was common to all other respondents, most of whom indicated that they would use the normal supervisory chain instead.[28] The GAO recently found that while two of thirteen foreign transit authorities reviewed have active programs of covert testing in place, as of September 2005, no such program was actively being conducted by the U.S. transit agencies the GAO had contacted.

The Role of Technology

The technological or nonhuman screening method of most interest was the use of explosives canine teams (which are already commonplace, used primarily to clear areas or suspicious items, but also in searches), ETDs, and closed-circuit television (CCTV). There is considerable interest in "smart" CCTV that can be programmed to detect unusual movement or lack of movement in tunnels, in stations, or on trains.

The benefits and limitations of these current technologies do not seem to be well understood. Transit agencies do appreciate the field tests recently conducted by TSA, but practical knowledge of the benefits and costs may not have made their way to the senior officials interviewed for this study. More reports similar to those published by the TRB on the costs and effectiveness of ETDs and canine teams would be helpful.

Many agencies have unrealistic expectations of future technology. What is wanted most is a system that screens large numbers of people for explosives. Some agencies also want a system that screens not only for explosives, but also for CBRN agents. Unfortunately, best estimates are that it will take five or more years to field and test the first type of system and additional years to deploy it. The second type of system is many more years away.

Placing hopes on technology is not an answer to the question of how to implement screening in mass-transit systems today.

Several chiefs said that TSA should play two roles in technology development, and for some, these constituted the largest plea for help. First, they wanted TSA to be a clearinghouse for technology so that transit agencies would not be the victims of exaggerated vendor claims and marketing efforts. Second, they wanted more R&D dollars to be concentrated on systems that could reliably detect explosives used in bombings, without having to create lines for screening. This would also allow for a selection method based on more than behavior.

TECHNOLOGIES FOR SCREENING IN THE PUBLIC-TRANSIT ENVIRONMENT

Technology plays an important role in screening passengers and baggage in the public transit environment. It is imperative that the government and transit operators understand the effectiveness of the technologies that are currently available for detecting the types and amounts of explosives used to create mass casualties. These officials must also be explicit about what will not be considered threat objects for purposes of technology-based screening—for example, knives or small amounts of explosives that would not cause significant casualties.

It is also important to understand the real-world limitations imposed by the need to maintain passenger throughput, quality control, and operator training; the need to maintain and repair screening devices and to provide power, space, and calibration; the need to understand thoroughly the interface between operator and technology; and the sensitivities of the public to intrusive screening.

The challenge of detecting explosives in a transit environment stands in stark contrast to the challenge in commercial aviation. The significantly greater amounts of explosives required for an attack on the mass transit system, the smaller percentage of passengers carrying bags or other containers large enough to carry such amounts, and the nonlaboratory settings in which the bombs used in the Madrid and London attacks were made strongly suggest that on a per-passenger, per-bag level, relatively robust detection can be achieved fairly easily.

However, the greater throughput demand and greater sensitivity to intrusive screening of mass-transit passengers pose challenges for screening technologies. Perhaps most important, in public transit, lines must be avoided wherever possible in order to move the largest possible number of passengers.

More research by TSA or the TRB could validate and quantify some of the following preliminary observations:

- In the immediate and near term, current technology can be used to screen only a small percentage of passengers, which in turn requires that passengers be selected. The selection cannot be performed with current technology.

- The less intrusive the search, the better. Hand searches may be objectionable in a transit environment when done too frequently, but trace and bulk detection offer relatively nonintrusive alternatives.
- In transit, as in any application, the relationship between the operator and the technology must be understood. Technology merely provides additional information to an operator, who must understand the limitations of the technology, what the information means, and how to combine it with other data to make a decision on whether a bag or a person constitutes a threat or needs to be examined further.
- Strategic investments are needed in R&D on technologies that can noninvasively detect explosives on individuals—and, more important, on groups of individuals—at standoff distances that provide enough time to intervene and direct passengers and their bags to be searched. (Standoff distances are usually defined as 10 meters or more.) Distances also should be great enough to minimize casualties if a suicide bomber were to self-detonate upon being selected for search. This appears to be the only effective method of screening large numbers of passengers without altering the nature of mass transit. In the future, "smart" CCTV, which recognizes faces, dress, movements, or suspicious behavior, might provide passive detection of comparable value and should be explored.
- The challenge of standoff explosives detection is significant. A 2004 National Academies of Science report provides the most comprehensive and publicly available discussion of technologies that might be applied to this problem.[29] A forthcoming TRB study will include an examination of available technology.

A review of the published literature yields some general observations. The most promising technologies—which again must be considered in a systems approach that includes operator interface—for detecting the bulk of explosives are the following:

- Active infrared, which shows the outlines of explosives worn against the body by detecting thermal contrast. This technology has been implemented in the past year but currently can be applied to only one individual at a time.
- Backscatter X-rays, which create an image of the person and explosives or weapons by enhancing the backscatter data of low energy X-rays. The ability to discriminate parts of the human body has made this technology controversial for personal privacy reasons.
- Active and passive millimeter-wave imaging, which detects heat naturally emitted by the human body, generating images of the heat silhouette to expose objects that block heat (passive imaging), or illuminates the scene with millimeter-wave energy and images the reflected and passive energy (active imaging). Applications have focused on

identifying improvised explosive devices (IEDs), especially those containing metallic shrapnel.

- Terahertz imaging and spectroscopy, which exploit the region between microwave and infrared on the electromagnetic spectrum, has the potential to achieve high resolution, good material penetration, and spectral information.

The technology for detecting individual traces of explosives with tabletop units is relatively proven, but standoff detection will not be feasible until problems in the collection and analysis of samples are solved.

Even assuming full-scale, government-managed procurement and deployment, introducing standoff screening technology on a wide scale would take probably three to five years. The ability to achieve passive standoff detection of more than one person would take many more years. However, these are important goals for the government to focus on.

Building a system that can detect both explosives and CBNR agents is technically difficult, and it may delay the development of techniques that can assist in detecting the low-tech, high-yield devices favored by the groups that have recently attacked transit systems.

Technology Field Demonstrations to Date

As stated above, most of the technologies available today were developed and deployed for aviation security. Aside from the obvious differences in passenger throughput and amounts of explosives needed for a significant attack (that is, the threat quantity), the physical environment of mass-transit systems can also challenge available technologies. Those that have been evaluated in the rail and transit environment include walk-through metal detectors, automated X-ray systems, trace portals, and infrared and millimeter-wave systems. TSA demonstrations have been conducted in the Washington, DC, New Carrolton Metro Station and Union Station to measure throughput, passenger reaction, and effectiveness. These demonstrations were performed in relatively nonchallenging test environments; that is, they did not include peak periods at major stations. Pilot evaluations conducted in the New York Port Authority Trans Hudson (PATH) system and Baltimore's Maryland Rail Commuter (MARC) system by DHS/S&T examined operational feasibility of selected technologies during peak and nonpeak throughput times, but not at high-demand stations. In all the pilot studies, appropriate numbers of TSA screeners were used to limit passenger distress, but this level of workforce typically would be unavailable.

The technologies evaluated are described below.

- **Walk-through metal detectors, hand wands, and automated X-ray systems**. The sensitivity of these types of equipment can be reduced from the level needed at airports to the level needed only to detect large weapons and large explosives. In test demonstrations, passenger throughput was not disrupted and passenger reaction was positive, but the screenings were not applied to all passengers during peak periods.
- **Explosive trace detection (ETD).** Tabletop units detect traces of explosives "swiped" from the exterior or interior surfaces of a bag, or any object touched by a bomb maker. This is standard equipment at airport checkpoints to screen computers, checked bags, and other objects that cannot be visually cleared. ETD units are effective when applied properly. They are relatively cheap, small, mobile, and sensitive to minute particles of explosives; but they require rigorous protocols for use to ensure proper calibration and to guard against contamination, as well as protocols to help operators deal with false positives (such as the identification of nitroglycerin used by heart patients). They are also relatively slow, requiring the object to be swiped and the sample to be analyzed. The TRB tested trace units in various environments to ensure that they could be used effectively. The test results generally demonstrated some operational limitations (environment, power needs, and so on) and a time of less than 2 minutes to complete an ETD test. The TRB found the units could be useful for clearing abandoned or lost articles and for analysis after a blast, but would not be feasible to use for passenger screening if lines were required.[30]
- **Trace document scanners**. This technology can be applied to cards (such as fare cards), papers touched by people, and hands. The most stable explosives are sticky, and only professional bomb makers can use laboratory procedures and hermetical sealing that would avoid detection. Trace document scanners have been tested by TSA twice in public transit (in the TRIP 1 test at New Carrolton and the Trip III test on the New Haven, Connecticut, Shore Line East commuter train). The scanner was used in combination with an X-ray and tabletop trace detector that screened passengers after they boarded the train. Passengers had to touch a card, and if the card activated an alarm when analyzed, the passenger went through secondary screening. This technology could be useful for screening selectees. A fingerprint scanner was evaluated during phase II of the S&T rail pilot at the MARC system at The Johns Hopkins University, apparently with successful results.
- **Trace portals**. Trace portals and infrared scanning are the only available technologies for screening individuals for explosives. Throughput is relatively slow (an average of 30 seconds per passenger).
- **Explosives canine teams**. While canine teams are commonly used in transit environments to clear areas after bomb threats or to respond to suspicious packages (TSA has trained and provided 53 teams to 8 transit agencies), the only mass-transit

system using them to screen passengers at the time of writing this monograph was Atlanta's Metropolitan Atlanta Rapid Transit Authority (MARTA) system. Two canine teams from TSA's canine program were deployed at MARTA in a demonstration mode. The dogs were specifically trained to focus on people in a mass-transit environment, rather than on objects. MARTA claims that the demonstration results were positive. Canines were also used to resolve alarms on checked bags screened with EDS (see below) during the TRIP II demonstration.

- **Explosives detection systems (EDSs)**. Advanced-technology bulk detectors, or certified EDS, detect the bulk of explosives rather than trace amounts. During TRIP II, conducted on Amtrak trains departing Union Station in Washington, DC, in June and July 2004, an EDS was used to screen baggage checked onto the train, and alarms were resolved using trace detectors or canine units (the former being a standard configuration for screening checked bags). TSA concluded that the EDS did not affect operations.
- **Millimeter-wave (MMW) and IR detection**. Infrared (IR) technology has been used in military applications and is well understood. Millimeter-wave technology (which has both an active and a passive form) was included in the second phase of the congressionally funded PATH tests. Although the report on the tests is not yet available, it appears that several performance and operational issues need to be resolved before MMW can be applied in the transit screening environment.[31]

THE VALUE OF SELECTIVE SCREENING REGIMES IN DIFFERENT THREAT SITUATIONS

A screening system that uses the most effective combination of selection techniques, maximizes unpredictability and deterrence, and is professionally planned and managed can have significant value in deterring attacks on urban mass transport, even if the screening is voluntary.

As noted earlier, deterring terrorist attacks, diverting terrorists to targets where there will be fewer casualties, or complicating their operational planning and thereby increasing the possibility of intelligence detection are all reasonable goals that selective screening can meet.

Screening also has several secondary benefits. It creates more chances for interaction between police officers and the public and between trained staff and the public, and it increases alertness and awareness. It can assist in evaluating and responding to other emergencies as well. Last, but by no means least, it can assist in the prevention and detection of other, nonterrorist crimes by providing additional police surveillance and deterrence against theft, assault, and the introduction of unlawful items into the system. In terms of risk reduction, even against jihadist attacks, some is better than none, and more is better than some.

What selection method or methods should be used? We exclude technology as a complete primary selection method and conclude that a selective screening program should include three basic components: random selection, behavioral profiling, and specific or general threat information. It also may be possible to make limited use of trained canines, which, if trained specifically to focus on moving passengers in a transit environment, can screen more than one person for explosives. The best regime is one that combines all these components and can weight each differently, depending on the threat circumstances.

Random selection should be the official selection method. Practiced thoroughly, it can introduce an underlying element of uncertainty for an attacker. It can also provide significant insurance against allegations of racial profiling, and it can help avoid legal challenges. There are, of course, risks that must be managed. First, the random selection obviously cannot be predictable by observation. For example, a system that screened every twentieth passenger every day would be easy to defeat. Introducing changes into the random sequence, preferably by using a calculator to generate a number at the checkpoint,

can mitigate this risk. Second, if the random selection rate is too low, deterrence will decrease. This can be managed by increasing the rate or by using behavioral profiling more aggressively.

Behavioral profiling by well-trained officers and employees who are familiar with the transit environment complements random screening by observing passengers approaching a screening operation, just as they can be observed entering trains or stations. This kind of observation is particularly valuable when people opt out of voluntary screening. Profiles based on the best information about the behavior of bombers and terrorists conducting surveillance or carrying out operations have proven valuable in several countries. Behavioral profiling can also be augmented with new information and new research as terrorists adjust their operations and training to evade detection. The situation will no doubt be dynamic as countermeasures generate intelligent reengineering of attacks. Security vendors and the transit industry are already investing in behavioral-profiling training, and it should not be difficult to increase the training.

General or specific threat information, if it is provided, should take precedence, but not complete dominance, over the first two components. Specific threat information is extremely useful but rarely available.

Qualified and well-trained canine teams can detect the plume from an explosive that might come from more than one person. In addition, terrorist operatives generally understand and respect the capabilities of search dogs, and other passengers respond positively to their presence. Finally, canines can be used to screen the baggage of individuals selected for screening. If a combination of teams trained to screen for explosive traces on people in a crowd and teams trained to search bags can be created, it can provide an additional element of selection, add significant deterrence, and assist in the screening process itself.

These screening system elements can be changed, expanded, or decreased, but only three are under the exclusive control of the transit agency. Random selection can be intensified or changed easily, behavioral profiling can be continuously improved through retraining, and canine units can be deployed and redeployed. But valid threat information either exists or it doesn't; it will be communicated, or it won't.

The general public may assume that situations of increased threat are always accompanied by specific threat information, but as transit agencies and other security professionals know all too well, this is more the exception than the rule. Nevertheless, when a threat situation is declared as elevated, a number of questions should be asked of federal intelligence agencies, and asked aggressively. Here are a few:

- How specific and reliable is the intelligence? Does it provide any details on the timing, the location, the attackers, or the method of attack, including the device that may be used?
- If an attack has occurred elsewhere, how much does it indicate that an attack on public transit in a particular area may be forthcoming? How close is it, geographically and functionally, to the system being protected? Is the group that conducted the attack assessed as having the means, the inclination, and the will to carry out operations in the United States? In the relevant cities?
- How long is the threat likely to last, and is the threat assessment likely to change? This is probably the most important practical question to be asked. It is important to know if the threat situation is implicitly tied to a specific time or group whose apprehension would result in a reduced threat level, or whether it is stated as a general condition with no known point of reduction in the foreseeable future. Of equal importance, the intelligence agencies should provide a sense of whether the specifics behind the threat information are likely to change, and when.

In this regard, there are different possibilities. In the 1990s, the Federal Aviation Administration (FAA) elevated security and then reduced it in at least two instances. In one, there was a specific threat (the Unabomber's public threat in 1998 to, among other things, bomb an aircraft flying to or from Los Angeles); the other was the result of a specific discovery (of a plot in 1995 by Ramzi Yousef, along with bombs, which were to be used to bring down 11 aircraft over the Pacific en route to the United States). Both the relative specificity of the intelligence information and the short period of time during which the measures had to be put in place made the situation entirely different from the current state, in which the existence of groups or individuals in the United States with means and a declared will to carry out attacks and to cause mass casualties may be assumed, with no end in sight.

Many criticisms of security measures and intelligence begin with a false premise—either that the intelligence is credible or specific, or that the government and its officials are overreacting, sometimes intentionally, to gain political capital or to reduce political risk should something happen. In reality, most threat environments lie somewhere between these extremes, forcing transit authority representatives and political leaders to make difficult choices, avoiding either overspending of valuable security resources and inconveniencing the public or leaving unacceptable vulnerabilities. All these factors increase the challenge for the manager of public information.

Given the almost infinite number of threat situations a transit agency could confront, it may help to categorize them and to consider whether a particular component of the selection mix should be emphasized for each category.

1. *Credible, specific, and short-term*. A specific event or piece of intelligence or an actual attack on a similar target has elevated the threat in ways that can be defined by some combination of location, timing, attackers, and method. All components should be strengthened to the maximum, but the highest priority should be given to combining behavioral profiling with specific threat information.
2. *Credible, less-specific, and evolving/longer-term*. Intelligence or an attack provides credible information but with fewer specifics on the actual attack mode. The threat is robust, and attackers can change tactics in unknown ways. The random element and behavioral profiling should be increased but could be altered in unpredictable ways to conserve resources. Canine teams, if available, should be added.
3. *Nonspecific and short-term*. Situations of general increased threat across the nation, or in a city, are assessed as including public transportation, but there are no specifics on the method of attack. Such situations may be tied to an anniversary, trial, or some other time-limited event. Because the threat is short-term, random selection, behavioral profiling, and the use of canine teams (if available) should be intensified.
4. *Nonspecific and long-term*. The threat exists, but there is no specific event or time period known and no apparent likelihood of it ending soon. This is the threat situation that currently applies to public or mass transit. Given resource constraints, increased random selection and behavioral profiling would be appropriate, supplemented where possible by canine presence.

There are some valuable ways to increase the impact of the screening system, particularly the element of deterrence. Some of the most useful ways to do this, many of which are already practiced by major transit agencies, are listed below and discussed in further detail in the next chapter.

1. *Alter screening locations*. Where 100 percent screening is not possible, changing the location of a screening operation in a random fashion and without warning can inject further uncertainty into the terrorists' operational planning.
2. *Actively involve police and transportation system staff*. This is essentially a form of community policing. Officers and paid staff who actively engage with passengers can acquire valuable information and can encourage public confidence and participation.
3. *Employ pop-up operations*. Transit agencies that have adequate resources can mass large numbers of highly armed officers to saturate a station or a set of trains to provide added deterrence and boost public confidence.

4. *Involve the public*. Most transit agencies have active campaigns of public engagement. From a practical standpoint, the traveling public is probably best placed to notice unusual individuals or activity. A passenger population that has been encouraged to do this, along with additional CCTV coverage, can significantly increase detection and deterrence of possible attacks.

CHARACTERISTICS OF A GOOD SCREENING PROGRAM

Determining the selection methodology is a key factor but not the only part of developing and sustaining an effective and professional public-transportation screening program. Many of the components are related and can be categorized as either specific characteristics of an effective screening system or general management practices.

CHARACTERISTICS OF AN EFFECTIVE MASS-TRANSIT SCREENING SYSTEM

High probability of detection. The probability that a screening system can identify a terrorist conducting surveillance or an operation and that of detecting a bomb during a search must be high. Using untrained dogs to locate explosives (as Pan Am tried before the Lockerbie incident) obviously will not work. Neither will screening checkpoints where there is little probability of detection. For screening purposes, the quantity of explosives needed to attack a transit system is relatively large compared to the quantity needed for attacks on aviation, and the probability of detection in a selective search should be high. Officers who are taught to recognize certain behavioral signs should have a fairly good probability of identifying them in the transit environment.

Deterrence maximized through unpredictability. Randomly moving screening locations, changing the random sequence of selection, and occasionally flooding stations with security personnel can introduce further unpredictability that multiplies the deterrent effect of partial, selective screening. The use of canines and technical equipment can also aid in deterrence.

Active engagement with the public and with passengers. A particularly important way to increase detection and deterrence and maintain public support is to have officers and trained staff actively engage with passengers. This is an extension of community policing, a goal most transit agencies are striving to achieve.

Easily expanded or contracted screening. The ability to expand or contract screening is important not only because of the deterrence advantages of moving locations, but also because threat situations will require screening functions to intensify and decline. Flexibility is key.

Use of the most appropriate, *field-deployable* technologies. An effective system will use the technologies that are most appropriate to the search function and that can operate

effectively in a transit environment. Currently available technologies include ETD, some less expensive bulk-detection equipment, and canine units. As DHS/TSA research continues and demonstrations show the utility (and limitations) of new equipment, new technologies can be introduced.

General Management Practices

Public outreach and education. As noted earlier, public resistance to screening and delays increases with time and distance from a terrorist event or specific intelligence information. The effectiveness and constitutionality of selective screening regimes will continue to be questioned. Public affairs officers need to be clear in explaining screening objectives without providing sensitive information; supervisors must respond quickly and thoroughly to complaints of unprofessional screening, and they must create and nurture support in key sectors of the public and the media. This will be hard work, particularly in communities that have not suffered an immediate attack, are highly sensitive to perceived invasions of civil liberties, or, perhaps most important, may already be suspicious of transit authorities for reasons unrelated to security.

Planning. Instituting a screening regime is a daunting and complex task that cannot be done both quickly and effectively. Transit authorities need to think ahead to the strong possibility that they will have to implement a selective screening regime, and they must specifically tie such a regime to events or threat levels that would demand immediate implementation. Contingency plans are key, and tabletop exercises should be repeated until roles and responsibilities are clearly understood and internalized and external relationships are established that will sustain the transit agency through the start-up process.

Policies and procedures. It is important to be explicit about what a screening regime is designed to accomplish, but *also* what it cannot accomplish. Concisely written policies should be implemented that treat, among other things, method of selection, search methods, training requirements, and supervisory controls. Detailed procedures that lay out specifically the who, what, where, and how of screening should be developed to support the policies. Procedural documents should be usable by first-line supervisors and subject to continuing review. They must be considered protected information.

Full costing of primary elements. Screening is expensive, and costs for a screening operation should be conservatively estimated, with adequate margin built in. Provision for

funding must be made internally or through prior agreement with local, state, or federal authorities. Planning to perform screening cheaply is programmed failure. Honest and careful cost estimating is important. Most cost elements are obvious, but some important elements may be hidden. Transit Cooperative Research Program (TCRP) Project J-10J will create a user-friendly guide for agency use and will provide some guidance on determining cost elements. For the moment, some of the more obvious items and complications are listed below:

- *Staffing*. Screening is workforce intensive, and salaries and benefits for all periods of work (including overtime, weekends, and holidays) must be factored in. It is critical to include consideration of turnover and burnout: Understaffing can create a dangerous situation of sudden attrition; overstaffing can result in obvious (and potentially publicly noticed and ridiculed) waste. Airport screening experiences should be reviewed for important lessons learned on how to create workforce and pay schedules that maintain morale but allow for flexibility.
- *Equipment*. The use of canine units or special equipment needs to be fully costed. Canine expenses have been well documented by the TRB; they are surprisingly large and include, among other things, overtime, canine acquisition, training and kenneling costs, management, and quality control.[32] The expenses for currently available trace units or X-ray machines (which may be effective in finding large amounts of explosives) are considerably less but can be underestimated easily. Elements that should be considered include:
  - *Acquisition, maintenance, and replacement*. It is important to study the past use of the equipment, build in margins, and ensure that servicing is part of the contract with the supplier.
  - *Consumables*. Many screening devices require consumables to be provided and stored properly.
  - *Initial and recurrent training*. Most equipment manufacturers provide training manuals. Care should be taken to ensure that the initial and recurrent training are of good quality and fully costed.
  - *Power and environment*. Care must be taken to ensure that the equipment selected can operate effectively in the real environment.

Protocols and training. Protocols and the initial and recurrent training based on them are key. Protocols should be developed for all elements of the system: selection of passengers; interactions with passengers; physical searching of persons or items carried by passengers; and methods to use when a suspicious object is found and for calling for backup or police presence. For both operational and legal reasons, all these protocols

should be clearly written, taught, practiced, and reviewed. Recurrent, and, when needed, remedial training are equally important. Lessons learned from past searches should be imparted to the officers or screening personnel. Training itself is costly—instructors must be paid, rooms must be found and rented, acceptable teaching materials must be procured, and appropriate areas for simulations must be found. It is vital that the full cost of training be included in cost estimates.

If special equipment, such as portable trace detectors, is used, additional protocols and procedures must be included in the training, in particular for alarm resolution. There is always the possibility of a false positive caused by pharmaceutical products, residue of firearms legally used by citizens or law enforcement and military personnel, or explosives used in mining. Protocols are needed that combine searching with questioning to ensure that false positives are resolved without infringing on passenger rights or letting true positives through.

Quality control/test and evaluation. It is important to maintain quality control, not only to ensure continued detection and professionalism, but also to ensure compliance with legal requirements, prevent abuses, and respond to those that may occur. This can be more complicated than it appears. Targets and metrics need to be determined and tracked in a carefully guarded, but simple data system. A few well-trained individuals will be needed to collect data and run internal (and possibly covert) evaluations on screenings, perhaps posing as passengers.

First-line supervision. First-line supervision is an essential element in maintaining effective and professional screening. Organizational theory and common sense both hold that if first-line supervisors are not knowledgeable, conscientious, energetic, ethical, and supportive of those who report to them, all the investment made will be for naught. Walking-around management and hands-on observation and supervision must be the order of the day.

Top-level support. Top-level management commitment is even more important than first-line management commitment. Far too often, security departments rank significantly lower than other passenger service functions in corporate hierarchies. In the airline industry before September 11, 2001, security was a minor afterthought compared with the investment in aviation safety, and with a couple of notable exceptions, its management was placed in the hands of people more trained in internal security and preventing fraud and theft than in defense against terrorist attacks. Effective screening has to be a top-level

requirement of the most senior transit manager, who should also bear the responsibility for managing the screening function.

CONCLUSIONS AND RECOMMENDATIONS

The terrorist threat will persist, and urban mass transportation presents an attractive target. While a number of steps have been taken by transit agencies and by government to increase security, passenger screening has been implemented by only two transit agencies, one local and one state. For a number of reasons, systemwide 100 percent passenger screening will be impossible until technology is developed and demonstrated that can screen large groups of people for explosives at standoff distances. Although not all attacks can be stopped and the public may support only systems that (falsely) promise no risk for the long run, steps can and must be taken to reduce significantly the possibility of terrorist attacks on urban mass transit. Selective screening regimes can reduce risk, particularly if they use an optimum mix of selection procedures; maximize deterrence; are planned, managed, and monitored professionally; and are accompanied by a campaign of public education and community involvement.

To return to the questions posed at the beginning of this monograph, we can answer them as follows:

- *If 100 percent passenger screening is not possible, does screening of only some passengers, even on a voluntary basis, make sense?* It does.
- *If only some passengers are screened, in the absence of specific intelligence, what should be the appropriate selection process?* A combination of random selection, behavioral profiling, and specific threat information, augmented in some instances by canine teams.
- *What combinations of selection methods are appropriate for different threat situations?* Where there is a credible but nonspecific threat, use of all methods should increase. When there is a credible and specific threat, specific intelligence information should guide behavioral profiling, with random selection being maintained as a base. Where there is a general long-term threat, random selection should remain the prominent mode.
- *What role can current and future technology play in passenger screening?* With the possible exception of using trained canine units to select passengers for screening, current technology can only make the selective searching of passengers and baggage less intrusive. Future technology, however, can play a major role in screening and should focus on improving current technologies and developing field-deployable systems that can detect explosives on individuals and in groups at standoff distances.
- *What are the characteristics of a good screening program?* A good screening program is carefully planned, is fully and realistically budgeted, has a downward flow of policies and procedures that clearly define its objectives and how it will achieve them, can be

increased or reduced flexibly, maximizes practices that increase unpredictability and deterrence, utilizes technology efficiently, is subject to a quality-assurance program, has continuing public outreach and education, and, most important, has strong senior-level support and first-class first-line supervision.

APPENDIX: SECURITY SURVEY FOR TRANSPORTATION ORGANIZATIONS

Mineta Transportation Institute (MTI)—National Transportation Security Center (NTSC) Questionnaire on Passenger Screening in Public Transit

Current State

1. What, if any, are the current methods used for surveillance and screening of transit passengers?
2. Are you currently using any methods of randomly selecting passengers for searches and, if so, what is the method used?
3. Are your staff and police officers trained in any method of behavioral recognition or "profiling"? If so, what is the method and how intensive is the initial and recurrent training?
4. How do you differentiate security measures during peak and off-peak hours, and between large and smaller stations? In other words, do you focus your passenger-based methods on large numbers of people or are you required, in order to maintain operational efficiency, to avoid imposing security during times of maximum passenger loads?
5. Have you ever received intelligence specific and credible enough to guide your surveillance or search program?
6. Do you have law enforcement presence that is dedicated to transit safety and security and can you estimate the size of this force? Asking the question another way, do you have police officers who are familiar enough with the transit environment to recognize and respond to something unusual or someone who is acting in a suspicious fashion?
7. What do you think is the right ratio of uniformed to undercover officers for the transit environment, assuming a continuation of the current threat assessment?
8. What in general is the procedure used if a transit staff member sees a suspicious object or person? Similarly, what procedure would a law enforcement officer use? What is the operating philosophy you teach and reinforce?
9. What is your operating philosophy on creating unpredictability in defensive measures obvious to a potential attacker? How have you implemented this philosophy where passengers are concerned?

10. How do you monitor your transit staff and police officers to ensure that they are alert and perform tasks assigned?
11. To what extent have you involved passengers and the public in attempting to identify unusual or suspicious activities? Can you describe these programs and share some of the results, both good and bad?
12. Do you have, or do you have plans to acquire, either trace detection or K-9 teams for resolving unclaimed bags or clearing after a bomb threat? What do you perceive the benefits and limitations of K-9 and trace detectors to be?
13. Have you ever considered or had advocated to you applying airport screening procedures and technologies (to a section of passengers)? What is your reaction to this concept?
14. What legal constraints do you understand authorities have interpreted to be in place for passenger screening?
15. If you have screened passengers before, what lessons did you learn? If you had to do it over again, what would you have done differently and what would you have done the same way?
16. What has been the general reaction of the public and passengers to any of the security efforts you have taken so far that are focused on passengers?

Prospective

1. Do you currently have contingency plans that include passenger screening? If so, what "events" or "threat levels" do you believe would have to exist before such screening—in any form—was to take place?
2. Do you currently have any contingency budget set up for screening or an agreed method for obtaining funds necessary for passenger screening?
3. If a confirmed act of terrorism were to take place on your system or to take place in a neighboring system with an assessment that a threat remains that can include yours, one presumes that the system would be closed and cleared. Before the system is put back into operation, what set of security measures would you advocate be put in place if the threat were that of a suicide bomber using a vest or a bag, or someone leaving a large bomb (like that used in Madrid or London) behind? Would you include some increased surveillance or screening of passengers and, if so, what methods would you advocate?

4. Do you envision putting into place a passenger screening system given a continuation of the current threat environment? Do you envision operationally testing such a system?
5. What are your thoughts on the use of random selection, behavioral profiling, or intelligence-based or compatible selection (type of bags carried, clothing, and even apparent ethnicity, age, and gender) in a screening regime?
6. Do you have any thoughts on the minimum number of passengers you believe should be screened in order to maximize deterrence?
7. Going back to the question of passenger loads, at what stations and during which hours would you concentrate your screening methods?
8. If you had to impose a passenger-screening regime, how would your transit agency attempt to maintain passenger or public support for it? How difficult would this become over time if there were no event reinforcing in the public's mind the need for the security procedure?
9. Do you have any grassroots estimates of how long you could sustain screening regimes based on the number of stations included, the number of passengers monitored and screened, or the manpower used?
10. Would you budget for resources to evaluate and test the screening regime? How do you think this should be done?
11. Passenger screening in transit is a difficult subject. Assuming no one actually advocates 100% screening, what do you fear most from governmental authorities on this subject? Conversely, what information and assistance would be most helpful to you?

ENDNOTES

EXECUTIVE SUMMARY

1. "A Guide to Transportation's Role in Public Health Disasters," *Surface Transportation Security*, Vol. 10, Transportation Research Board, National Cooperative Highway Research Program Report # 525, pp. 60-61.
2. For a current overview of efforts to increase the security of passengers in rail (including transit) transportation, see Cathleen A. Berrick, *Passenger Rail Security: Enhanced Federal Coordination Needed to Prioritize and Guide Security Efforts*, Testimony before the Committee on Commerce, Science, and Transportation, Washington, DC: U.S. Government Accountability Office, GAO-07-225T, January 18, 2007.
3. Ibid., p. 14.
4. David Randall Peterman, *Passenger Rail Security: Overview of Issues*, Washington, DC: Congressional Research Service, Order Code RL32625, updated May 26, 2005, p. 2, available at www.fas.org/sgp/crs/homesec/RL32625.pdf.
5. Berrick, op. cit., pp. 16-17.
6. Berrick, op. cit., p. 15.
7. "Securing Our Nation's Rail Systems," July 2006, available at www.dhs.gov/xprevprot/programs/editorial_0895.shtm, accessed December 5, 2006.
8. Berrick, op. cit., p. 19.

SCOPE OF THE STUDY AND DEFINITION OF TERMS

9. In London, the bomber (Hasib Hussain) apparently detonated aboard a bus either because of delays in the subway on the way to his target train or because his device malfunctioned and required a new battery. The bus appears to have been a secondary target. See *Report of the Official Account of the Bombings in London on 7th July 2005*, House of Commons Report HC 1087, May 11, 2006, pp. 5-6.

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10. Brian Taylor et al., *Designing and Operating Safe and Secure Transit Systems: Assessing Current Practices in the United States and Abroad*, MTI Report 04-05, San José, CA: Mineta

Transportation Institute, November 2005.

METHODS OF SELECTING AND SCREENING PASSENGERS

11. American Public Transit Association (APTA) Teleconference, "Transit Security Priorities Post-9/11," October 2006.

12. *Transit Capacity and Quality of Service Manual–2nd Edition*, Transit Cooperative Research Program (TCRP) Report # 100, Washington, DC: Transportation Research Board, 2003, pp. 2-21.

13. "Chicago's Airports Forecast Record Summer Travel," Chicago Airport System News Release, City of Chicago, Department of Aviation, May 25, 2006.

14. At some ferry terminals, the throughput demands are less, the access points are fewer, and the departures are less frequent, so while problems of staffing, costs, equipment, screening protocols, and passenger delay and frustration would remain, the design of a screening system is less inherently problematic.

15. Jocelyn Waite, "The Case for Searches on Public Transportation," *TRB Legal Research Digest*, No. 22, October 2005 (published under TCRP Project J-5, "Legal Aspects of Transit and Intermodal Transportation Programs"), pp. 18-19.

16. *Terrorist Activity Recognition and Reaction for Transit Employees*, National Transit Institute, Federal Transit Administration (Washington, DC: U.S. Department of Transportation, n.d.).

17. Waite, op.cit., p. 19. The U.S. Supreme Court upheld the use of racial profiling by U.S. Border Patrol agents making stops along the U.S.-Mexico Border.

18. An increase in the use of smart cards and contactless smart cards will facilitate a faster flow of passengers than is currently the case, making screening lines even more infeasible.

19. *K-9 Units in Public Transportation: A Guide for Decision Makers*, Report 86: Public Transportation Security, Vol. 2, Washington, DC: TRB Transit Cooperative Research Program, June 2002, p. vii. This guide did not consider canine units for routine screening of passengers.

20. Bruce Hoffman, "The Logic of Suicide Terrorism," *Atlantic Monthly*, June 2003, p. 2.

LIMITATIONS ON PASSENGER SCREENING

21. Waite, op. cit., p. 25.

22. W. Kip Viscusi and Richard J. Zeckhauser, *Sacrificing Civil Liberties to Reduce Terrorist Risks*, Cambridge, MA: John M. Olin Center for Law, Economics, and Business, Discussion Paper No 401, p. 32.
23. Ibid., p. 25.

CURRENT PRACTICES

24. The questionnaire is reproduced in the appendix of this report.
25. Berrick, op. cit.
26. BASS was developed by Richard DiDomenica's Protecting the Homeland Innovations, LCC, after September 11, 2001.
27. One transit agency gave some indication of having at least tested a search regime.
28. Berrick, op. cit., pp. 23-24.

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29. Committee on the Review of Existing and Potential Standoff Explosives Detection Techniques, National Research Council, National Academies of Science, *Existing and Potential Standoff Explosive Detection Techniques*, ISBN: 0-309-09130-6, available at National Academies Press, http://www.nap.edu/, accessed December 5, 2006.
30. *Applicability of Portable Explosive Detection Devices in Transit Environments*, Public Transportation Security Volume 6, Transit Cooperative Research Program (TCRP) Report 86, Washington, DC: Transportation Research Board, 2004, pp. 1-3.
31. E-mail to Bruce Butterworth from Christopher C. Kelly, Associate Director, Strategic Communications, Science and Technology, Department of Homeland Security, dated January 30, 2007.

CHARACTERISTICS OF A GOOD SCREENING PROGRAM

32. Transit Cooperative Research Program, June 2002, op. cit.

ABBREVIATIONS AND ACRONYMS

ACLU	American Civil Liberties Union
APTA	American Public Transportation Association
BASS	Behavioral Assessment Screening System
CBRN	Chemical, biological, radiological, and nuclear weapons
CCTV	Closed-circuit television
DHS	Department of Homeland Security
DOT	Department of Transportation
EDS	Explosives detection systems
ETD	Explosives trace detection
FAA	Federal Aviation Administration
FTA	Federal Transit Administration
GATT	General Agreement on Tariffs and Trade
IDF	Israeli Defense Forces
IED	Improvised explosive device
IR	Infrared
K-9	Canine team
LIRR	Long Island Railroad
MARC	Maryland Rail Commuter
MARTA	Metropolitan Atlanta Rapid Transit Authority
MMW	Millimeter wave
MTA-NYCT	Metropolitan Transit Administration's New York City Transit
MTI	Mineta Transportation Institute
NYPD	New York Police Department
PATH	Port Authority Trans Hudson
R&D	Research and development
S&T	Science and Technology Directorate
SIDA	Secure Identification Display Area
SPOT	Screening of Passengers by Observation Technique
TCRP	Transit Cooperative Research Program

TRB	Transportation Research Board
TSA	Transportation Security Administration
VBIED	Vehicle-borne improvised explosive devices
VRE	Virginia Railway Express
WMATA	Washington Metropolitan Area Transit Authority
WTO	World Trade Organization

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BRIAN MICHAEL JENKINS

Brian Michael Jenkins is one of the world's foremost authorities on terrorism and sophisticated crime. From 1989 to 1998, Mr. Jenkins was the Deputy Chairman of Kroll Associates, an international investigative and consulting firm. Before that, he was chairman of RAND's political science department, where from 1972 to 1989, he also directed RAND's research on political violence. He is currently a senior advisor to the president of RAND.

Mr. Jenkins has a bachelor of arts degree in fine arts and a master's degree in history, both from UCLA. He studied at the University of Guanajuato in Mexico and in the Department of Humanities at the University of San Carlos in Guatemala, where he was a Fulbright Fellow and recipient of a second fellowship from the Organization of American States.

Commissioned in the infantry at the age of 19, Mr. Jenkins became a paratrooper and ultimately, a captain in the Green Berets. He is a decorated combat veteran, having served in the Seventh Special Forces Group in the Dominican Republic during the American intervention and later as a member of the Fifth Special Forces Group in Vietnam (1966–1967). He returned to Vietnam on a special assignment in 1968 to serve as a civilian member of the Long Range Planning Task Group; he remained with the group until the end of 1969, receiving the Department of the Army's highest award for his service. Mr. Jenkins returned to Vietnam in 1971 on a special assignment.

Mr. Jenkins is the author of *International Terrorism: A New Mode of Conflict*, the editor and coauthor of *Terrorism and Personal Protection*, co-editor and co-author of *Aviation Terrorism and Security*, and co-author of *The Fall of South Vietnam*. He is also the author of numerous articles, book chapters, and published research reports on conflict and crime.

In 1996, President Bill Clinton appointed Mr. Jenkins to be a member of the White House Commission on Aviation Safety and Security. From 1999 to 2000, he served as an advisor to the National Commission on Terrorism and in 2000 was appointed to be a member of the U.S. Comptroller General's International Chamber of Commerce (ICC) and a member of the board of directors of the ICC's Commercial Crime Services. Mr. Jenkins was also a member of the Transportation Research Board/National Research Council Panel on Transportation: Science and Technology for Countering Terrorism in 2002.

Mr. Jenkins has led the Mineta Transportation Institute's counterterrorism research team since 1997, producing three volumes of case studies of major terrorist attacks on surface transportation.

BRUCE R. BUTTERWORTH

Bruce Butterworth has had a distinguished government career in the Congress and the Executive Branch. Between 1975 and 1980, as a professional staff member for the House Government Operations Committee, he ran investigations and hearings on many transportation safety issues, particularly in aviation. He spent 11 years in the Department of Transportation, eight of them in the Office of the Secretary of Transportation. He managed negotiations on the inclusion of air and maritime services in the General Agreement on Tariffs and Trade (GATT—now the World Trade Organization[WTO]), chaired U.S. delegations to United Nations Committees, dealt with transport and aviation issues related to border inspections, and was part of the response to the attack on Pan Am 103.

Mr. Butterworth has held two executive posts in aviation security. As Director of Policy and Planning (l991–1995), he established strategic, long-term, and contingency plans and federal rules. As Director of Operations (1995–2000), he was responsible for federal air marshals, hijacking response, and 900 field agents; he worked hard to improve security and the performance of security measures by U.S. airports here and by U.S. airlines worldwide. He ran the FAA's aviation command center, successfully managing the resolution of hijackings and security emergencies. He launched a successful program of dangerous-goods regulation and cargo security after the 1995 ValuJet crash, oversaw the conversion of the air marshal program to a full-time program with high standards, was a key player in the response to the ValuJet and TWA 800 accidents, and was a frequent media spokesperson. He worked closely with the Congress, the National Security Council staff, the intelligence community, law enforcement agencies, and authorities of other nations.

Between September 2001 and January 2003, he was an associate director at the United States Holocaust Memorial Museum and was responsible for security there.

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PEER REVIEW

San José State University, of the California State University system, and the MTI Board of Trustees have agreed upon a peer view process to ensure that the results presented are based upon a professionally acceptable research protocol.

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