An All Hazards Context for Coordinated, All Modes, Security-Related Research

Presented by
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August 2007
1863 Charter of the National Academy of Sciences

“. . . the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art . . .”

The work of The National Academies is reported through an Annual Report to Congress.
Cycle of All Hazards Research — Transportation

1. TRB Committee on Critical Transportation Infrastructure Protection shares research results from all sources & identifies research needs

2. AASHTO Special Cmte on Transportation Security identifies and refers research needs

3. NCHRP 20-59 panel funds applied research or refers prioritized requests

- 10,000 TRB Annual Meeting Participants
- 75 other technical meetings
- TRB Annual Field Visits to DOTs and University Research Centers
- State/Local Government
- Non-Government Organizations
- Federal Agencies
- Private Sector
The Hazards and Disaster Management System

Pre-Impact Interventions
- Mitigation Practices
- Emergency Preparedness Practices
- Recovery Preparedness Practices

Post-Impact Responses
- Emergency Activities (planned and improvised)
- Recovery Activities (planned and improvised)

Events

Disaster Impacts
- Physical
- Social

Disaster Event Characteristics
- Frequency
- Predictability
- Controllability
- Length of Forewarning
- Magnitude of Impact
- Scope of Impact (spatial and social)
- Duration of Impact

Hazard Vulnerability
- Hazard Exposure
- Physical Vulnerability
- Social Vulnerability

Hazard Exposure

Pre-Impact Trans-Impact Post-Impact

Chronological Time

Social Time

Developing a Strategy to Counter Terrorism Requires a Roadmap; Each Component of the Roadmap Requires Research

How can we best reduce the supply of terrorists?

Direct Action

- Offensive/Foreign
  - Military Strategy and Programs
  - Intelligence Strategy and Programs
  - Police and Justice

Support Denial

- International Development
- Political Actions
- Counter- and Non-Proliferation

Defensive/Domestic

Preventive Measures
- Response Measures
- Threat and Risk Analysis

Homeland Security

- How can we best allocate scarce HS dollars?
- Does security deter?

Why do they hate us? What makes them hate us more?

Source: Riley, (2004), Reducing the Risks and Consequences of Terrorism, CREATE Conf.
Security Counter-Measures Timeline

Preparation for New Threats
- Conduct Exercises & gather intell
- Equip & Train for Counter measures
- Harden key targets

Prevent Emphasis
- Alter visible deterrence
- Public Relations & Incentives For intell
- Shifts in Sensors, inspection & interviewing

Intervention Emphasis
- Segregate by risk of individual
- Public Relations On threat
- Shifts in inspection & interviewing

Respond & Recover
- LOE & Contingency Actions
- Resume or Continue Normal ATS

Years prior to attack
- Conduct Probes
- Identify Intent of Attack
- Select Target

Year to Months prior to attack
- Identify Vulnerabilities & Match capabilities
- Select Method
- Select Resources & Train

Committed to Attack Timing
- Position People
- Position Materiel
- Begin Attack

Time of attack
- Try to evade known defenses
- Diversions Or Follow-up

Select an Attack
- Plan & Train the Attack
- Launch an Attack
- Exploit an Attack

Source: adapted from Anderegg, The MITRE Corporation, 2006
Research explains how uncertainty leads to doubt

(a) Integrated Recognition-Primed Decision model

(b) Uncertainty as a barrier to action

Source: Klein, Sources of Power (1998)
Multidisciplinary Center for Earthquake Engineering Research (MCEER) General Framework for Quantification of Resilience: Extent of Disruption and Recovery Time

Further Elaboration: MCEER Resilience Domains

- **Technical**: Physical Systems—Location-Based & Distributed Critical Facilities
- **Organizational**: Attributes, Dynamics of Organizations & Institutions
- **Social**: Attributes, Dynamics of Communities and Populations
- **Economic**: Attributes, Dynamics of Local and Regional Economies & Their Constituent Units (e.g. Businesses)

Source: Bruneau & Tierney, Resilience: Defining and Measuring What Matters (MCEER 2006)
http://mceer.buffalo.edu/
## Resilience Property Space & Examples

<table>
<thead>
<tr>
<th>Dimension/Domain</th>
<th>Technical</th>
<th>Organizational</th>
<th>Social</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundancy</td>
<td>Capacity for Technical Substitutions, “Work-Arounds”</td>
<td>Alternate Sites for Managing Disaster Operations</td>
<td>Availability of Housing Options for Disaster Victims</td>
<td>Ability to Substitute, Conserve Needed Inputs</td>
</tr>
<tr>
<td>Resourcefulness</td>
<td>Availability of Materials for Restoration, Repair</td>
<td>Capacity to Improvise, Innovate, Expand</td>
<td>Capacity to Address Human Needs</td>
<td>Capacity to Improvise, Innovate</td>
</tr>
<tr>
<td>Rapidity</td>
<td>System Downtime, Restoration Time</td>
<td>Time Between Impact &amp; Early Recovery</td>
<td>Time to Restore Life-line Services</td>
<td>Time to Regain Capacity, Lost Revenue</td>
</tr>
</tbody>
</table>
Resilience quantification

\[
\bar{R} = \frac{1}{N_I} \sum_{I=1}^{N_I} \left\{ \frac{1}{N_E} \sum_{E=1}^{N_E} \int_{t_{0E}}^{t_{0E}+T_{RE}} \left\{ 1 - L(I, T_{RE}) \left[ H(t_{0E}) - H(t_{0E} + T_{RE}) \right] \right\} \cdot \alpha_R \cdot f_{rec}(t, t_{0E}, T_{RE}) \cdot dt \cdot P_E(0, T_{LC}) \right\} \cdot P(I)
\]

Where:
- \(N_E\) Number of extreme events expected during the lifespan (or control period) \(T_{LC}\) of the system
- \(N_I\) Number of different extreme events intensities expected during the lifespan (or control period) \(T_{LC}\) of the system
- \(T_{RE}\) Recovery time from event \(E\)
- \(t_{0E}\) Time of occurrence of event \(E\)
- \(f_{rec}(t, t_{0E}, T_{RE})\) Recovery function
- \(H(t_{0E})\) is a step function (=0 for \(t < t_{0E}\); =1 otherwise)
- \(\alpha_R\) Recovery factor =1 for full recovery
- \(L(I, T_{RE})\) Normalized loss function
- \(P(I)\) Probability that an event of given intensities happens in a given time interval \(T_{LC}\)
- \(P_E(0, T_{LC})\) Probability that an event happens \(E\) times in a given time interval \(T_{LC}\)

Source: Bruneau & Tierney, Resilience: Defining and Measuring What Matters (MCEER 2006)
Disasters Roundtables
January 2001 - present

21: Disaster Recovery (Wednesday, October 17, 2007)
20: Creating and Using Multi-Hazards Knowledge and Strategies
19: Protecting Lives and Property at our Coastlines
18: Citizen Engagement in Emergency Planning for a Flu Pandemic
17: Rebuilding for Health, Sustainability, and Disaster Preparedness in the Gulf Coast Region
16: Community Disaster Resilience
15: Law, Science, and Disaster
14: The Indian Ocean Tsunami Disaster: Implications for U.S. and Global Disaster Reduction and Preparedness
13: Lessons Learned Between Hurricanes: From Hugo to Charley, Frances, Ivan, and Jean
12: Creating a Disaster Resilient America: Grand Challenges in Science and Technology
11: Public Health Risks of Disasters: Building Capacity to Respond
10: Reducing Future Flood Losses: The Role of Human Actions
9: Hazards Watch: Reducing Disaster Losses Through Improved Earth Observations
8: The Emergency Manager of the Future
7: The National Earthquake Hazards Reduction Program at Twenty-Five Years: Accomplishments and Challenges
6: Alerting America: Effective Risk Communication
5: From Climate to Weather: Impacts on Society and Economy
4: Countering Terrorism: Lessons Learned from Natural and Technological Disasters
3: Sea Level Rise and Coastal Disasters
2: Natural Disasters and Energy Policy
1: Urban/Wildland Fire Interface (January 26, 2001)
Making the Nation Safer: The Role of Science and Technology in Countering Terrorism

NRC Policy Study released June 25, 2002

- **Predict**: Intelligence and surveillance of targets and means
- **Prevent**: Disrupt networks, contain threats
- **Protect**: Harden targets, immunize populations
- **Interdict**: Frustrate attacks, manage crisis
- **Response & Recovery**: Mitigate damage, expedite cleanup
- **Attribute**: Identify attacker to facilitate response

Source: Downey, TRB Annual Meeting 2003
Making the Nation Safer

General Strategies and Research Needs

• Biological  Research, prepare, distribute response to pathogens
• Chemical/Explosives  Sensors & filters
• Info Technology  Network security/ER communications
• Energy  SCADA controls/adaptive grid/vulnerabilities
• Cities/Infrastructure  Emergency responder support
• Transportation  Layered system security
• People  Trusted spokespersons
• Complex Systems  Data fusion/data mining/red-teaming
• Cross-Cutting Technology  Sensors/robots/SCADAs/systems analysis
• Deployment  Homeland Security Institute, Partnerships among feds/states/locals/universities
• Nuclear  Control weapons & materials at source

Source: Downey, TRB Annual Meeting 2003
An Infrastructure Owner’s View of a Layered, Integrated Security System

- DHS – Global Intelligence
- DHS - Immigration
  - DHS – Weapons/Explosives/ Bio Chemical Tracking/Control
  - State/Local Law Enforcement
  - Facility Screening/ Intrusion Detection (Operations)
  - Physical Denial/ Barrier (Eng.)
  - Structural Hardening to Survive Threat (Engineered)

Source: Englot, PANY&NJ, 2004
Transportation Research Board Communications and Outreach

- TR News magazine
- Weekly newsletter
- Open calls for papers
- Open solicitations for
  - Research problems
  - Project proposals
  - IDEA proposals
  - Panel nominations
- Interactive Annual Meeting program

November-December 2000

May-June 2004

March –April 2004

May-June 2005

March –April 2004

May-June 2007

November-December 2007

March –April 2007

May-June 2007

May-June 2007

May-June 2007

www.TRB.org
Transportation Sector Rationale for An All Hazards Approach to Natural Hazards and Security

1. Safety first: build on the successful experience of the systems approach, and extend the mission of existing safety personnel

2. Build on DOT expertise in response: urban areas work with law enforcement, fire, rescue, and towing and recovery on traffic incident management; statewide presence with emergency contracting, equipment (e.g., communications systems), personnel, and common response to weather emergencies; trained to observe and report

3. Build on transit expertise in security: in urban areas parallel size and location of high-value infrastructure; invested; bring expertise on policing and security; trained to observe and report

4. Make interdependence an asset: transportation depends on, and is depended on, by other critical infrastructures; roads and transit are publicly owned and managed, and house public involvement experts
Six Goals for Transportation Security

1. **Social**: Involve the public--make pre-operational surveillance riskier

2. **Budget & Policy**: Make risk-informed decisions the norm

3. **Technical**: focus on countermeasures & design (instead of vulnerabilities & threats) with dual benefits

4. **Operational**: quick, layered response with effective surge capability

5. **Psychological**:  
   - for the public, peace of mind/acceptance of risk: security $\approx$ satisfaction  
   - for the attack planner, transportation is a difficult target, prepare more or attack something easier

6. **Intelligence**: Support police/military/intelligence by having trained transportation employees report suspicious activities and by making the bad guys stretch out their planning time

**Desired Outcome**

**Mainstreaming** an integrated, high level, all-hazard, National Incident Management System (NIMS)-responsive, multimodal risk management process into major transportation agency programs and activities
Continuous Development of Risk Management and Emergency Response Planning Guidance

2002: Guides to Vulnerability Assessment & Emergency Response Planning
2002-2003: workshops
2004-2005: publications that anticipated NIMS, NRP, and NIPP.
2007-2008: publications for balloting by AASHTO

2007 (anticipated)
A Guide to Risk Management of Multimodal Transportation Infrastructure
(NCHRP Project 20-59(17))

2008 (anticipated)
A Guide to Emergency Response Planning at State Transportation Agencies
(NCHRP Project 20-59(23))
Policy and Applied Research Audiences Differ

Applied research is developed through cooperative programs to provide tools, guides, and resources to owners and operators of transportation infrastructure.

Research program guidance and policy advice are provided to Legislative and Executive branches upon request.
Cooperative Research Programs at the Transportation Research Board

• National Cooperative Highway Research Program (NCHRP) – 1962
  American Association of State Highway and Transportation Officials (AASHTO)

• Transit Cooperative Research Program (TCRP) – 1992
  Federal Transit Administration

• Commercial Truck and Bus Safety Synthesis Program – 2001
  Federal Motor Carrier Safety Administration

• Airport Cooperative Research Program (ACRP) – 2005
  Federal Aviation Administration

• Strategic Highway Research Program II (SHRP II) – 2005
  Federal Highway Administration in association with AASHTO

• National Cooperative Freight Research Program (NCFRP) – 2006
  Research and Innovative Technology Administration

• Hazardous Materials Cooperative Research Program (HMCRP) – 2006
  Pipeline and Hazardous Materials Safety Administration
### TRB’s Cooperative Research Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Established</th>
<th>$ Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCHRP (Highways)</td>
<td>1962</td>
<td>35</td>
</tr>
<tr>
<td>TCRP (Transit)</td>
<td>1992</td>
<td>9</td>
</tr>
<tr>
<td>ACRP (Airports)</td>
<td>2004</td>
<td>10</td>
</tr>
<tr>
<td>NCFRP (Freight)</td>
<td>2006</td>
<td>2.6</td>
</tr>
<tr>
<td>HMCRP (HazMat)</td>
<td>2006</td>
<td>0.9</td>
</tr>
<tr>
<td>CTBSSP (Truck/ Bus Safety)</td>
<td>2001</td>
<td>0.3</td>
</tr>
</tbody>
</table>
State DOTs
- Funds: 5.5% of Statewide Planning and Research Funds (2% from certain categories)
- Voluntary contributions by the state DOTs
- Pooled by FHWA
- Problems (Selected by AASHTO)

Applied research focus
- National issues
- Shared issues

Contract research
- Panels
- Research contractors
**Problem Submittals and Selections**

- Authorized sources
  - State Departments of Transportation
  - AASHTO committees
  - Federal Highway Administration

- Selection of recommended problems by AASHTO Standing Committee on Research

- Approved by AASHTO Board of Directors (2/3rds vote)
National Cooperative Highway Research Program

Panels

Research Contractors

Research Results
National Cooperative Highway Research Program Organizational Structure

Three-Way Agreement

FHWA

AASHTO SCOR Set Priorities

NAS/TRB

NCHRP Staff Management

Research Programs

Funding Allocation

Oversight

Secretariat

Funding

Oversight

NCHRP Research Contracts
Cooperative Research Program Panel Responsibilities

RFPs

- Define Scope of Research (2 day meeting)

Comments & Modifications

- Select Contractor (1 day meeting)

Guidance

- Monitor Progress (1 or more meetings)

Comments & Modifications

- QPRs & Interim Reports

- Draft

- Review and Approve Report (mail ballot and/or meeting)

Comments & Modifications

- Proposals

Guidance

- RFPs
TRB Research Management Began with 1950s “Road Tests”
Transportation Research Board Policy Studies & Activities

In Progress
– Assessment of Security Technologies for Transportation (National Materials Advisory Board, lead)
– Role of Public Transportation in Emergency Evacuation

Scoping Activities
– Systems Approach to Building Security Into the Transportation System
– Private Sector Input into Design of DHS National Program of Exercises
Committee on Critical Transportation Infrastructure Protection:
One of 220 TRB Standing Committees

More than 10,000 attendees see 2,600 presentations as they participate in the 500 sessions of the Transportation Research Board Annual Meeting held every January in Washington, D.C. The 87th Annual Meeting: January 13-17, 2008.

Transportation Research Information Services (TRIS) Database—World’s Largest

http://ntl.bts.gov/tris

Research In Progress (RiP) Database

Coming Soon: Research Needs Database
Innovations Deserving Exploratory Analysis (IDEA)

Eight Transit IDEA projects address security; five have been completed.

January 6, 2006, presentation on Transit IDEA Project 45, Chemical and Biological Decontamination System for Rail Transit Facilities (completed January 2007).
Cooperative Research Security Projects Authorized: 90

—Projects in Development or Contracts Pending: 13
—Projects in Progress: 19
—Projects Completed: 58
Go to www.TRB.org/SecurityPubs for live links to Transportation Research Board documents

Transportation Security: A Summary of Transportation Research Board Activities
8/2/2007
A slideshow summary of the Transportation Research Board’s pre- and post-September 11, 2001 security activities is updated monthly. [More]

Cooperative Research Programs Security Research Status Report
8/2/2007
TRB’s Cooperative Research Program produces a table summarizing more than 80 security and emergency preparedness projects representing over $11 million in the contract research programs for state departments of transportation and the public transportation industry. Updated monthly. [More]

Conceptualizing and Measuring Resilience: A Key to Disaster Loss Reduction
7/17/2007
A featured article in the May-June 2007 issue of TR News explores the components, dimensions, and implications of disaster response of resilience, which can be measured by the functionality of an infrastructure system after a disaster and also by the system’s ability to return to previous levels of functionality. [More]
From 1987 onward, infrastructure spending by states and localities have accounted for around \( \frac{3}{4} \) of total public spending on transportation and water infrastructure.

Source: Congressional Budget Office, Trends in Public Spending on Transportation and Water Infrastructure, 1956 to 2004 (August 2007)
Governors’ Role in Protecting Critical Infrastructure

• Identifying the state’s critical infrastructure
• Conducting vulnerability and risk assessments
• Identifying and understanding interdependencies
• Investing in infrastructure improvements
• Developing regional strategies
• Coordinating with the private sector

http://www.nga.org/Files/pdf/0703GOVGUIDEHS.PDF
Electricity Generation, Transmission, and Distribution Losses

Source: Lawrence Livermore National Laboratory
Estimated U.S. Freshwater* Withdrawals in 2000:
~345,000 Mgal/day

Source: Lawrence Livermore National Laboratory
Flow chart for influenza response and containment operations

http://www.who.int/csr/disease/avian_influenza/guidelines/protocolfinal30_05_06a.pdf
## Comparison of Features

<table>
<thead>
<tr>
<th></th>
<th>SARS</th>
<th>“The Flu”</th>
<th>Pandemic Influenza</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virus</strong></td>
<td>Coronavirus</td>
<td>Influenza A or B</td>
<td>Influenza A H5N1</td>
</tr>
<tr>
<td><strong>Origin</strong></td>
<td>China</td>
<td>Ubiquitous</td>
<td>Asia, spread by migratory birds</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>All ages</td>
<td>Elderly, very young</td>
<td>All ages</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td>Flu symptoms, pneumonia</td>
<td>Fever, malaise, muscle pains</td>
<td>Flu symptoms, organ failure</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Human to human</td>
<td>Human to human</td>
<td>Human to human (?)</td>
</tr>
<tr>
<td><strong>Incubation</strong></td>
<td>? 10 days</td>
<td>Short incubation</td>
<td>2-4+ days</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>Supportive care</td>
<td>Supportive care, anti-virals</td>
<td>Supportive care, anti-virals??</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td>10%</td>
<td>&lt; .01%</td>
<td>2.5 - 50%</td>
</tr>
</tbody>
</table>

Source: Avian Flu ICWG Brief 2 March 2006
Group quarters

Institutionalized group quarters

- Correctional
- Nursing homes
- Juvenile
- Other

Noninstitutionalized group quarters

- College dorms
- Military
- Group homes
- Emergency shelters
- Other

Number in millions

SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2006*, Figure 2. Data from the U.S. Census Bureau.
Ports by Value with Freight Movements

Source: AASHTO, TRANSPORTATION INVEST IN OUR FUTURE: A New Vision for the 21st Century (July 2007)
Index of U.S. Domestic Freight Ton-Miles (1996 = 100)

Source: Bureau of Transportation Statistics Special Report 2, A Decade of Growth in Domestic Freight: Rail and Truck Ton-Miles Continue to Rise (July 2007)
2006 Class I Railroad Tons Originated

Source: AAR, Class 1 Railroad Statistics, May 2007
U.S. Gasoline Distribution System

Graphic: Courtesy of NACS National Association of Convenience Stores
© Copyright 2000 PennWell MAPSearch (used with permission)
U.S. Gasoline Supply Network – By Region

Graphic: Courtesy of NACS National Association of Convenience Stores
Source: Source: Energy Analysts International, Inc.
http://www.familyfareconveniencesstores.com/ShopWithUs/Gasoline.aspx
Enhancing Defense Against the Nuclear & Radiological Threat

Carrier Y

Carrier X back office

Carrier X manifest

Tracking system one

Tracking system two

Hazmat shipper’s bill of lading

Truck 1

Truck 1 manifest data from Carrier X

Communications interface (VPN / https)

Temporary connection

Location and status of Truck 1

First Responder Dispatch

TTC Dispatch (voice)

TSA

Conf. call

1st

2nd

3rd

1st

2nd

3rd

Hazmat response data
# Organization of Federal Disaster, Civil Defense, and Defense Mobilization Functions, 1950-2006

|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|

Source: *Facing Hazards and Disasters* (National Academy of Sciences, 2006)
Principal State DOT Needs for Security Technical Assistance per 1st AASHTO/TRB Survey (January 2002)

1. Security Training
2. Vulnerability Assessment
3. Outside Assessment Teams
4. Best Practices/Model Plans
5. Emergency Response Plans/Exercises
6. ITS Technology
7. Bridge Protection/Hardening
8. Surveillance
9. Facility Restoration
10. Communication/Coordination
11. Information/Intelligence
12. Information Technology
13. Cyber Security
Principal State DOT Needs for Security Technical Assistance per 2nd AASHTO/TRB Survey (June 2004)

1. Training and Exercises
2. Communications, including interoperability, equipment standards, etc.
3. Cost Effective Methods for Hardening of Facilities and Assets
4. Vulnerability Assessments
5. Surveillance
6. Funding
Principal State DOT Needs for Security Technical Assistance per 3rd AASHTO/TRB Survey (July 2007)

1. Integrating homeland security considerations in the planning process
2. Infrastructure design for homeland security
3. Assessing transportation network homeland security vulnerabilities (risk assessment)
4. Detecting, deterring, & mitigating homeland security threats
5. All hazards interagency communication & coordination for emergency preparedness & response
6. All hazards emergency preparedness & response including emergency transportation operations
7. All hazards planning for end-to-end evacuation
8. General homeland security awareness
State DOT Security-Related Research Needs per 3rd AASHTO/TRB Survey (July 2007)

1. Traffic & Evacuation Planning (7 needs suggested)
2. Infrastructure Security (5 needs suggested)
3. Multi-State Coordination (4 needs suggested)
4. Port/Freight Security (3 needs suggested)
5. Communications (2 needs suggested)
6. Risk Assessment (2 needs suggested)
7. Other (7 needs suggested)

Bridge/Tunnel/Highway Infrastructure Vulnerability Workshops February-March 2003
1. Sacramento, California
2. Albany, New York
3. Austin, Texas

http://security.transportation.org/?siteid=65&pageid=1363
http://security.transportation.org/sites/security/docs/guide-VA_Appendices.pdf
A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents available May 2002

CONTRACTOR’S FINAL REPORT

A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents

Examples of Different Communications Systems to Achieve Redundancy

- Statewide land-mobile radio communication systems
- State microwave telephone systems
- Satellite information systems
- Public telephone systems and facsimile operations
- Cellular telephone systems
- Vehicle scanners
- Auxiliary radio system
- Emergency radio system
- Computer systems
- Two-way direct-connect communications, e.g., NEXTEL, and two-way pagers
- Internet communications
- High priority telephone service for government agencies. For example:

Prepared For
The American Association of State Highway and Transportation Officials’ Section
As
National Cooperative Highway Research Program Project 20-07/Task 151A

Prepared By
Parsons Brinckerhoff – PB Farradyne
3200 Tower Oaks Boulevard
Rockville, MD 20852

May 2002


Table 1: Program of Commitments

<table>
<thead>
<tr>
<th>COMMIT to a program that enables the public transportation system to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>⇒ PREVENT incidents within its control and responsibility, effectively protect critical assets;</td>
</tr>
<tr>
<td>⇒ RESPOND decisively to events that cannot be prevented, mitigate loss, and protect employees, passengers, and emergency responders;</td>
</tr>
<tr>
<td>⇒ SUPPORT response to events that impact local communities, integrating equipment and capabilities seamlessly into the total effort; and</td>
</tr>
<tr>
<td>⇒ RECOVER from major events, taking full advantage of available resources and programs.</td>
</tr>
</tbody>
</table>

“Blue Ribbon Panel on Bridge and Tunnel Security” report presented institutional, fiscal, and technical recommendations.

http://www.fhwa.dot.gov/bridge/security/brpcover.htm
Integrated analysis of six major natural hazards – floods, drought, cyclones, earthquakes, volcanoes, and landslides – in relationship to exposed population and economic activity and associated vulnerability – 2.5’ x 2.5’ grid cells

Source: Chen, Analysis of Global Natural Disaster Hotspots, Disasters Roundtable 20, 28 June 2007
http://dels.nas.edu/dr/docs/dr20/Chen.pdf
Natural Disaster Hotspots: A Global Risk Analysis (2005)

Source: Chen, Analysis of Global Natural Disaster Hotspots, Disasters Roundtable 20, 28 June 2007
http://dels.nas.edu/dr/docs/dr20/Chen.pdf
Natural & Technological Disasters Cost $52 Billion/Year
Since 1980, 67 Natural Disasters Have Killed 21,000+ in the United States

Billion Dollar Climate and Weather Disasters 1980-2005


Sources: Grand Challenges for Disaster Reduction & National Climatic Data Center
### Incident Scale/Public Preparedness

#### Classification

<table>
<thead>
<tr>
<th>EVENTS</th>
<th>LOCAL</th>
<th>REGIONAL</th>
<th>STATE</th>
<th>NATIONAL</th>
</tr>
</thead>
</table>
| EXAMPLES        | • Minor Traffic Incidents  
• Minor Load Spills  
• Vehicle Fires  
• Vehicle Fires  
• Minor Train/Bus Accidents  
• Accidents w/ Injuries but No Fatalities | • Train Derailment  
• Major Bus/Rail Transit Accidents  
• Major Truck Accidents  
• Multi-vehicle Crashes  
• Hazmat Spills  
• Injuries & Fatalities | • Train Crashes  
• Airplane Crashes  
• Hazmat Incidents  
• Multi-vehicle Accidents  
• Tunnel Fires  
• Multiple Injuries & Fatalities | • Terrorist Attack/WMD  
• Floods, Blizzards, Tornadoes  
• Transportation Infrastructure Collapse  
• Extended Power/Water Outage  
• Riots  
• Mass Casualties |
| EXPECTED EVENT DURATION | 0 - 2 HOURS | 2 - 24 HOURS | DAYS | DAYS | WEEKS |

#### Source

Source: Contestabile, Maryland Department of Transportation, 2006
Disasters by Design: A Reassessment of Natural Hazards in the United States (1999)

American Hazardscapes: The Regionalization of Hazards and Disasters (2001)
A “System of Systems” Perspective Is Needed for Analyzing Infrastructure Interdependencies

A Risk-Based Decision Support System Is Being Developed for Infrastructure Protection and Interdependency Analysis

Interdependent Infrastructures

Threats

Vulnerabilities

Consequences

Risk

Decision Support System

- Identification of Critical Nodes
- Consequences of Attacks (cascading effects)
- Consequences of Response Actions
- Measures of Effectiveness
- Investments & Strategies for Prevention, Protection, Mitigation, Response, & Recovery

Six Grand Challenges for Disaster Reduction Identified by the National Science and Technology Council (2005)

1. Provide hazard and disaster information where and when it is needed.
2. Understand the natural processes that produce hazards.
3. Develop hazard mitigation strategies and technologies.
4. Recognize and reduce vulnerability of interdependent critical infrastructure.
5. Assess disaster resilience using standard methods.

Note: In this document, the terms disasters and hazards encompass events with both natural and technological origins.
Making the Nation Safer – NAS Study and Recommendations

Securing The Homeland - Homeland Security Strategic Plan

Physical Security
- Critical Infrastructure Protection Plan
- National Infrastructure Protection Plan (R&D Chapter)
- Physical Infrastructure Security Plan
- NIPP National Annual Report R&D Section

Cyber Security
- NITRD Cyber Security WG 2005 Report
- NITRD/CSIA Cyber Security Plan
- INFOSEC Hard Problems List
- PITAC Cyber Security Study

WMD
- WMD Strategic Plan
- Biological Defense Strategy
- BioWatch Implementation
- Nuclear Materials Detection Plan

Response/Preparedness
- National Response Plan
- Subcommittee on Disaster Reduction Plan
- Disaster Relief Group Plan
- Strategy For Homeland Defense and Civil Support
- National Pandemic Response Plan
- National Biological Integrated Surveillance System
- National Agricultural Security Plan

Chemical Plant Security Regulations
- National IED Strategy

Countering Terrorism Resources and Research Priorities in the Social, Behavioral and Economic Sciences
- National Intelligence Strategy of the USA

Source: John Voeller, DHS Representative, NSTC May 2007

Recommendations Already Merged
1 – Technology requirements from each sector, OIP Programs, and PCIS, are aggregated and prioritized to form mission and operator-driven requirements and plans, with advice input from DHS S&T.

Source: John Voeller, DHS Representative, NSTC  May 2007
The Process of Getting From A Sector To A National Plan

Source: John Voeller, DHS Representative, NSTC May 2007

Collaboration Conversations

Consolidated Views

Sector Annual Report
National CIP Annual Update

Basis For National IP Roadmap
Physical Critical Infrastructure and Key Resources

Critical Infrastructure
- Food & Agriculture
- National Monuments & Icons
- Banking & Finance
- Chemical & Hazardous Materials
- Defense Industrial Base
- Water
- Public Health and Healthcare

Key Resources
- Government Facilities
- Dams
- Commercial Facilities
- Nuclear Power Plants

KEY OBSERVATIONS
- Physical Critical Infrastructure - thirteen sectors that provide the production of essential goods and services, interconnectedness and operability, public safety, and security that contribute to a strong national defense and thriving economy
- Key Resources - facilities, sites, and groups of organized people whose destruction could cause large-scale injury, death, or destruction of property and/or profoundly damage our national prestige and confidence

Figure A

Source: DHS, PANDEMIC INFLUENZA PREPAREDNESS, RESPONSE, AND RECOVERY GUIDE FOR CRITICAL INFRASTRUCTURE AND KEY RESOURCES, September 19, 2006
Relationships of National Security Strategies and Plans

National Strategy for Homeland Security
- HSPD-3
- HSPD-5
- HSPD-7
- HSPD-9
- NSPD-41/NSPD-13
  - National Incident Management System
  - National Response Plan
  - National Infrastructure Protection Plan
  - National Preparedness Goal
  - Transportation Sector Specific Plan
  - Maritime Modal (Sub-Sector) Implementation Plan

Intelligence Reform & Terrorism Prevention Act of 2004
- Maritime Transportation Security Act of 2002
  - National Strategy for Transportation Security
  - Maritime Appendix of National Strategy for Transportation Security
  - Maritime Infrastructure Recovery Plan
  - Plan to harmonize to each other
  - International Outreach and Coordination Strategy
  - Domestic Outreach Plan
  - Maritime Operational Threat Response Plan
  - Maritime Transportation System Security Recommendations
  - Maritime Commerce Security Plan
  - Plan to Re-establish Cargo Flow After a Security Incident
  - Area Maritime Security Plans
  - Salvage Response Plans
  - Facility Security Plans
  - Vessel Security Plans

Security and Accountability for Every Port Act of 2006

Strategy to Enhance International Supply Chain Security

Source: Strategy to Enhance International Supply Chain Security
Generalized International Cargo Supply Chain

Source: Strategy to Enhance International Supply Chain Security
National Planning Structure as Related to the International Cargo Supply Chain

http://www.dhs.gov/xlibrary/assets/plcy-internationalsupplychainsecuritystrategy.pdf
Components of the National Preparedness System

1. National Preparedness Goal
2. 15 planning scenarios
3. Universal Task List (UTL)

4. Target Capabilities List identifies areas in which responding agencies are expected to be proficient in order to meet the expectations set out in the UTL
5. National Response Plan
6. National Incident Management System
1. Construction of the HSPD-8 National Preparedness Goal

**Implements**
- National Strategy for Homeland Security
- Homeland Security Presidential Directive 8

**Accompanies**
- National Incident Management System (NIMS)
- National Response Plan (NRP)
- National Infrastructure Protection Plan (NIPP)

**Aligns**
- Statewide strategies
- First responder preparedness assistance
- First responder equipment standards and R&D needs
- National training program
- National exercise program
- Federal performance measurements
- Relevant Federal regulatory requirements
- Maintenance of specialized Federal assets
- Annual report on Nation’s level of preparedness

Source: Implementation Status Overview, September 14, 2004: DHS OSLGCP 27 December 2004
Threats and hazards that present the greatest risk have been defined by a Homeland Security Council-led interagency working group.

<table>
<thead>
<tr>
<th>Explosives Attack – Bombing Using Improvised Explosive Device</th>
<th>Biological Attack – Food Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Attack – Toxic Industrial Chemicals</td>
<td>Nuclear Attack – Improvised Nuclear Device</td>
</tr>
<tr>
<td>Chemical Attack – Chlorine Tank Explosion</td>
<td>Cyber Attack</td>
</tr>
<tr>
<td>Biological Attack – Aerosol Anthrax</td>
<td>Biological Attack – Foreign Animal Disease (Foot and Mouth Disease)</td>
</tr>
<tr>
<td>Chemical Attack – Nerve Agent</td>
<td>Natural Disaster – Major Earthquake</td>
</tr>
<tr>
<td>Chemical Attack – Blister Agent</td>
<td>Natural Disaster – Major Hurricane</td>
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<tr>
<td>Radiological Attack – Radiological Dispersion Devices</td>
<td>Disease Outbreak – Pandemic Influenza</td>
</tr>
<tr>
<td>Biological Attack – Plague</td>
<td></td>
</tr>
</tbody>
</table>

Source: Implementation Status Overview, September 14, 2004: DHS OSLGCP 27 December 2004
4. The Target Capabilities List

Common
- Planning
- Interoperable Communications ★

Prevent Mission Area
- Information Collection and Threat Detection
- Intelligence Fusion and Analysis
- Information Sharing and Collaboration ★
- Terrorism Investigation and Apprehension
- CBRNE Detection ★

Protect Mission Area
- Risk Analysis
- Critical Infrastructure Protection Food and Agriculture Safety and Defense
- Public Health Epidemiological Investigation and Testing
- Citizen Preparedness and Participation

Respond Mission Area (cont)
- Firefighting Operations/Support
- WMD/Hazardous Incident Response and Decontamination ★
- Explosive Device Response Operations ★
- Animal Health Emergency Support
- Environmental Health and Vector Control
- Citizen Protection: Evacuation and/or In-Place Protection
- Isolation and Quarantine
- Search and Rescue
- Emergency Public Information and Warning
- Triage and Pre-Hospital Treatment
- Medical Surge ★
- Medical Supplies Management and Distribution
- Mass Prophylaxis ★
- Mass Care (Sheltering, Feeding, and Related Services)
- Fatality Management

Respond Mission Area
- On-Site Incident Management
- Emergency Operations Center Management
- Critical Resource Logistics and Distribution
- Volunteer Management and Donations
- Worker Health and Safety
- Public Safety and Security Response

Recover Mission Area
- Structural Damage Assessment and Mitigation
- Restoration of Lifelines
- Economic and Community Recovery

Source: ODP Rollout Presentation, 31 May 2005
5. Relationship: NIMS and NRP

National Incident Management System (NIMS)

Used for all events

Incident

Local Response

State Response or Support

Federal Response or Support

NIMS aligns command, control, organization structure, terminology, communication protocols, resources and resource-typing for synchronization of response efforts at all echelons of government.

DHS integrates and applies Federal resources both pre and post incident.

Resources, knowledge, and abilities from Federal departments & agencies.

National Response Plan (NRP)

Activated for incidents of national significance.

Source: FEMA NIMS Briefing, 28 December 2004
6. National Incident Management System

“...a consistent nationwide approach for federal, state, tribal, and local governments to work effectively and efficiently together to prepare for, prevent, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.” -HSPD-5

Source: FEMA NIMS Briefing, 28 December 2004
**Preparedness & Response Continuum**

- **NIPP**
  - Pre-Event State
  - ID Critical Infrastructure Components
  - Assess **Vulnerabilities**
  - Assess Threats & Risk
  - Develop Protective Measures & Mitigation Strategies
  - Priorities Protective Measures
  - Implement Protective Measures
  - R&D

- **EVENT**

- **NRP**
  - Post-Event State
  - Plan & Train (CDP)
  - Implement Response Plans
  - Monitor Infrastructures
  - Assess Response Capability
  - Contain Impact/Effect
  - Implement Mitigation
  - Recovery
  - Return to Normalcy

Source: [http://www.orau.gov/DHS_RE_Summit07/Presentations/Clarke.pdf](http://www.orau.gov/DHS_RE_Summit07/Presentations/Clarke.pdf)
Four Overlapping Phases of NIMS Adoption

First Phase: Initial Staff Training: Complete EMI Course – NIMS, An Introduction

Available from Emergency Management Institute
training.fema.gov/EMIWeb/IS/is700.asp

Second Phase: Evaluation of Existing Plans, Policies, and Procedures

Third Phase: Modification of Existing Plans, Procedures, and Policies

Fourth Phase: Verify Achievement of NIMS Integration Center Standards

- Certification and Credentialing
- Conducting Exercises

Source: NIMS Implementation Plan Template, 30 December 2004
DHS Goals: Secretary’s Priorities

- Keep terrorists, criminals and unlawful entrants out of the U.S.
- Prevent dangerous materials, weapons and illicit drugs from entering the country
- Strengthen screening of workers/travelers
- Secure critical infrastructure
- Build nimble, effective emergency response system and culture of preparedness
- Strengthen core management to ensure DHS is a great organization

Source: Jay M. Cohen, Under Secretary, Science and Technology Directorate, 2006
## S&T Divisions: Customers & Portfolios

<table>
<thead>
<tr>
<th>Detect &amp; Defend Against WMD</th>
<th>National Culture of Preparedness</th>
<th>Control Our Borders</th>
<th>Strengthen Screening of Travelers</th>
<th>Secure Critical Infrastructure</th>
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</thead>
<tbody>
<tr>
<td>Department of Justice</td>
<td>AS Cyber and Telecommunications</td>
<td>Customs &amp; Border Protection</td>
<td>AS Grants and Training Federal Law Enforcement Training Center</td>
<td>AS Infrastructure Protection</td>
</tr>
<tr>
<td>Federal Law Enforcement Training Center</td>
<td>Department of Justice DHS Office of Intelligence and Analysis</td>
<td>TSA Citizenship and Immigration Services</td>
<td>Director of Counternarcotics</td>
<td>Department of Justice</td>
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<tr>
<td>Transportation Security Administration</td>
<td>Federal Law Enforcement Training Center</td>
<td>U.S. Secret Service</td>
<td>Customs &amp; Border Protection</td>
<td>TSA</td>
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<td>Customs and Border Protection</td>
<td>TSA Citizenship and Immigration Services</td>
<td>U.S. Secret Service</td>
<td>U.S. Coast Guard</td>
<td>Customs and Border Protection</td>
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<td>FEMA</td>
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<td>U.S. Secret Service</td>
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<table>
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<tr>
<th>Explosives</th>
<th>Chem/ Bio</th>
<th>Command, Control &amp; Interoperability</th>
<th>Borders/ Maritime</th>
<th>Human Factors</th>
<th>Infrastructure/ Geophysical</th>
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<td>Counter-MANPADS</td>
<td>Chem/Bio Transition to Ops</td>
<td>State/Local Preparedness and Response</td>
<td>Human Systems Integration Technology Development</td>
<td>Human Systems Integration Technology Development</td>
<td>Preparedness Response</td>
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<td>Agro-Defense</td>
<td>Cyber and Information Security</td>
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<td></td>
<td></td>
<td>Threat Characterization</td>
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<td>Joint Risk Assessment Program</td>
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</tr>
</tbody>
</table>

### Awareness – Prevention – Protection – Response - Recovery

Source: Jay M. Cohen, Under Secretary, Science and Technology Directorate, 2006
S&T Organization

DHS U/S S&T

Director of Research
Starnes Walker

Director of Innovation
Roger McGinnis (Acting)

Director of Transition
Bob Hooks

Explosives
Jim Tuttle

Chem/Bio
John Vitko

Command, Control & Interoperability
Dave Boyd

Borders/ Maritime
Merv Leavitt

Human Factors
Sharla Rausch

Infrastructure/ Geophysical
Caroline Purdy

Source: Jay M. Cohen, Under Secretary, Science and Technology Directorate, 2006
Federal Homeland Security R&D, by Agency
(budget authority in millions of constant FY 2006 dollars, FY 2002-2007)

Source: AAAS, based on Office of Management and Budget data. Includes conduct of R&D and R&D facilities.
Note: DOD expanded its reporting of HS spending beginning in 2005.
FEB. '06 REVISED © 2006 AAAS
www.aaas.org/spp/rd
DHS R&D Priorities, FY 2004 - FY 2007 (Final)
budget authority in millions of dollars

Source: AAAS, based on DHS budget documents and final FY 2007 appropriations. Does not include $125 million FY 2007 rescission.

OCTOBER '06 © 2006 AAAS
www.aaas.org/spp/rd
Dept. of Homeland Security R&D: FY 2007 (FINAL)
(millions of dollars budget authority)

- Biological Countermeasures, $350
- Chemical Countermeasures, $60
- Explosives Countermeasures 1/, $87
- Radiological & Nuclear Ctrmeas. (DNDO), $273
- Threat Awareness, $35
- Standards, $22
- R&D for DHS Agencies, $86
- University & Fellowship, $50
- Emerging & Prototypical Tech. 3/, $19
- Counter MANPADS, $40
- Other DHS, $106

Total FY 2007 R&D: $1.1 billion (Final before rescission)

Source: AAAS estimates of R&D in final FY 2007 DHS appropriations. Does not include $125 million undistributed rescission.

OCTOBER '06 © 2006 AAAS  www.aaas.org/spp/rd
Power Relationships Among Emergency Management Stakeholders

Source: *Facing Hazards and Disasters* (NAS, 2006) adapted from Lindell et al., 1997
Core Topics of Hazards and Disaster Research

- Hazards Research
  - Hazard Vulnerability
  - Hazard Mitigation
- Disaster Preparedness
- Disaster Research
  - Emergency Response
  - Disaster Recovery

Source: Facing Hazards and Disasters (NAS, 2006), adapted from Tierney et al., 2001
Cooperative Research Programs

National Cooperative **Highway** Research Program
**Transit** Cooperative Research Program
**Airport** Cooperative Research Program
National Cooperative **Freight** Research Program
**Hazardous Materials** Cooperative Research Program
**Commercial Truck and Bus** Safety Synthesis Program

TRB is Broadly Engaged in Hazards and Security
Cooperative Research to be Consolidated 2007-08
AASHTO Committees Expected to Adopt and Maintain Flagships

Operations

- 20-59(23) Guide to Emergency Management at State Transportation Agencies
- TCRP 86, Vol. 11: Security Measures for Ferry Systems
- NCHRP 525, Vol. 10: A Guide to Transportation’s Role in Public Health Disasters
- NCHRP 525/TCRP 86, Vol. 9: Guidelines for Transportation Emergency Training Exercises
- NCHRP 525/TCRP 86, Vol. 8: Continuity of Operations (COOP) Planning Guidelines for Transportation Agencies

Infrastructure

- 20-59(17) Guide to Risk Management of Multimodal Transportation Infrastructure
- NCHRP 525, Vol. 11: Disruption Impact Estimating Tool—Transportation (DIETT): A Tool for Prioritizing High-Value Transportation Choke Points
- NCHRP 525/TCRP 86, Vol. 12: Making Transportation Tunnels Safe and Secure
<table>
<thead>
<tr>
<th>Report</th>
<th>Title</th>
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<tr>
<td>12</td>
<td>Making Transportation Tunnels Safe and Secure</td>
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<tr>
<td>11</td>
<td>Disruption Impact Estimating Tool--Transportation (DIETT): A Tool for Prioritizing High-Value Transportation Choke Points</td>
</tr>
<tr>
<td>10</td>
<td>A Guide to Transportation's Role in Public Health Disasters</td>
</tr>
<tr>
<td>9</td>
<td>Guidelines for Transportation Emergency Training Exercises</td>
</tr>
<tr>
<td>8</td>
<td>Continuity of Operations (COOP) Planning Guidelines for Transportation Agencies</td>
</tr>
<tr>
<td>7</td>
<td>System Security Awareness Training for Transportation Employees—CD</td>
</tr>
<tr>
<td>6</td>
<td>Guide for Emergency Transportation Operations</td>
</tr>
<tr>
<td>5</td>
<td>Guidance for Transportation Agencies on Managing Sensitive Information</td>
</tr>
<tr>
<td>4</td>
<td>A Self-Study Course on Terrorism-Related Risk Management of Highway Infrastructure</td>
</tr>
<tr>
<td>3</td>
<td>Incorporating Security into the Transportation Planning Process</td>
</tr>
<tr>
<td>2</td>
<td>Information Sharing and Analysis Centers: Overview and Supporting Software Features</td>
</tr>
<tr>
<td>1</td>
<td>Responding to Threats: A Field Personnel Manual</td>
</tr>
</tbody>
</table>
Transit Cooperative Research Program

Report 86, Volume
12 Making Transportation Tunnels Safe and Secure
11 Security Measures for Ferry Systems
10 Hazard and Security Plan Workshop: Instructor Guide
9 Guidelines for Transportation Emergency Training Exercises
8 Continuity of Operations (COOP) Planning Guidelines for Transportation Agencies
7 Public Transportation Emergency Mobilization and Emergency Operations Guide
6 Applicability of Portable Explosive Detection Devices in Transit Environments
5 Security-Related Customer Communications and Training for Public Transportation Providers
4 Intrusion Detection for Public Transportation Facilities Handbook
3 Robotic Devices for the Transit Environment
2 K9 Units in Public Transportation: A Guide for Decision Makers
1 Communication of Threats: A Guide

Legal Research Digest 22: The Case for Searches on Public Transportation
New IDEAs for Transit: Annual Report of the Transit IDEA Program
Projects Delivered to Others or Publication Pending

Completed, Delivered to Others

- Scan: Tools for Prioritizing Anti-Terrorist Security Measures
- White Paper on Decontamination Procedures
- White Paper on Technology Clearinghouse
- Transit Security Roundtables and International Conference
- Blue Ribbon Panel on Bridge and Tunnel Security
- Emergency Response Workshops
- Vulnerability Assessment Workshops
- A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents
- A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection
- National Needs Assessment for Ensuring Transportation Infrastructure Security
- Peer Review of Disaster Response Issues in Transportation Planning

Completed, Publication Pending

- Public Transportation Passenger Security Inspections
Current Cooperative Research Program Security Projects

- Risk Management of Multi-modal Transportation Infrastructure Aug. 2007
- Strategic Assessment of Wireless Capabilities/Needs for Transit Oct. 2007
- Emergency Quarantine and Isolation Controls of Rural Roads Dec. 2007
- Blast-Resistant Highway Bridges: Design/Detailing Guidelines June 2008

- A Guide to Transportation and Hazards Resources in development/contract pending
- Safety and Security in Roadway Tunnels
- Simulation-Based Training & Exercise of Civil Aviation Emergency Personnel
- Identification/Delineation of Incident Mgt. & Multi-Agency Emergency Resp.
- Assessing Emergency Response Needs and Capabilities for HazMat Releases
- Emerging Technologies for Safe & Secure Transportation of Hazardous Materials
- Emergency Evacuation & Repopulation — Employee Coping w/ Traumatic Events
### Table 72. How countermeasures deter, detect, and respond to hazards and threats.

<table>
<thead>
<tr>
<th>Deterrence</th>
<th>Detection</th>
<th>Response</th>
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<tr>
<td><strong>Operational Tactics</strong></td>
<td><strong>Operational Tactics</strong></td>
<td><strong>Operational Tactics</strong></td>
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<tr>
<td>- Roving patrols</td>
<td>- Intelligence</td>
<td>- Command and control (multi-tenant)</td>
</tr>
<tr>
<td>- Bomb-sniffing dogs</td>
<td>- Security awareness training of operating</td>
<td>- Evacuation protocol</td>
</tr>
<tr>
<td>- Background checks of employees</td>
<td>and maintenance personnel</td>
<td>- Information sharing</td>
</tr>
<tr>
<td>and contractors</td>
<td>- Roving patrols</td>
<td>- Tunnel ventilation</td>
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<tr>
<td>- Background checks of facility</td>
<td>- Guards at entry points</td>
<td>- Portable fire extinguishers</td>
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<tr>
<td>vendors</td>
<td>- Bombing-sniffing dogs</td>
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</tr>
<tr>
<td>- Access control</td>
<td>- Identification card system</td>
<td></td>
</tr>
<tr>
<td>- Credentialing and identification</td>
<td>- Inspections</td>
<td></td>
</tr>
<tr>
<td>card system</td>
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<td></td>
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<tr>
<td>- Guards at entry points</td>
<td></td>
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<tr>
<td>- Intelligence</td>
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<td>- Hazardous material restriction</td>
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<td>- Inspections</td>
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<td><strong>Technology</strong></td>
<td><strong>Technology</strong></td>
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<tr>
<td>- CCTV</td>
<td>- Intrusion detectors</td>
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<tr>
<td>- Intrusion detectors</td>
<td>- Identification card readers</td>
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<tr>
<td>- System integration</td>
<td>- Chemical/biological/radiological detectors</td>
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<td>- Seismic/stress detectors</td>
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<td></td>
<td>- Mobile monitoring</td>
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<td></td>
<td>- Explosive detectors</td>
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<td>- System integration</td>
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<td><strong>Engineering</strong></td>
<td><strong>Engineering</strong></td>
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<tr>
<td>- Blast design</td>
<td>- Fire detection</td>
<td></td>
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<tr>
<td>- Elimination of hidden corners,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>alcoves, and shelves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Open, unimpeded lines of sight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Locked facility doors</td>
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</tr>
</tbody>
</table>
Table 1. Categorization of GSMs. *(General Security Measures)*

<table>
<thead>
<tr>
<th>GSM Categories and Sub-Categories</th>
<th># of GSMs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fencing/Barriers</strong></td>
<td></td>
</tr>
<tr>
<td>Retractable vehicle barriers/gates</td>
<td>5</td>
</tr>
<tr>
<td>Fixed vehicle deterrent with pedestrian access</td>
<td>4</td>
</tr>
<tr>
<td>Fixed, both vehicle and pedestrian deterrent</td>
<td>5</td>
</tr>
<tr>
<td><strong>Access Control</strong></td>
<td></td>
</tr>
<tr>
<td>Credentials</td>
<td>13</td>
</tr>
<tr>
<td>Locks</td>
<td>3</td>
</tr>
<tr>
<td>System Control</td>
<td>3</td>
</tr>
<tr>
<td><strong>Intruder Sensors</strong></td>
<td></td>
</tr>
<tr>
<td>Perimeter (doors &amp; windows, walls &amp; fences, and buried)</td>
<td>13</td>
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<tr>
<td>Volume sensors – motion detectors</td>
<td>9</td>
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<tr>
<td><strong>Monitoring</strong></td>
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</tr>
<tr>
<td>Lighting</td>
<td>3</td>
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<tr>
<td>CCTV/video</td>
<td>7</td>
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<tr>
<td><strong>Procedural/Low Cost</strong></td>
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<td><strong>Waterside Security</strong></td>
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<td>Surface</td>
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<td>Underwater</td>
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<td><strong>Screening</strong></td>
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<td>Passengers and Cargo</td>
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<td>Trace Detection</td>
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<td><strong>Human Observation</strong></td>
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<td>All Areas</td>
<td>3</td>
</tr>
<tr>
<td>Waterside</td>
<td>2</td>
</tr>
</tbody>
</table>
Highways, rail, and waterway choke points
Key variable: Impact on commercial shipments
Prioritize on net national economic impacts
Excludes replacement costs & collateral damage

- Transportation response options to an extreme event with chemical, biological, or radiological agents
- Focuses on the effect and role of transportation
- Applicable to all civilian sites (not just transportation sites)

**TERET (Tracking Emergency Response Effects on Transportation) – Spreadsheet Layout**

**Sheet 1: Introduction**
Provides summary instructions

**Sheet 2: Basic Services**
Assess criticalities that may develop from ER changes in traffic patterns.

**Sheet 3: Mass Care**
Assess needs during shelter-in-place, temporary shelters, or quarantine shelter.

Hazard and Security Planning Tools for Rural, Small Urban, and Community-Based Public Transportation Operations
### Table 1  Emergency Events Affecting Transportation Agencies

<table>
<thead>
<tr>
<th>Naturally Occurring</th>
<th>Human-Caused</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intentional</td>
</tr>
<tr>
<td>Droughts</td>
<td>Bomb Threats and Other</td>
</tr>
<tr>
<td>Dust/Wind Storms</td>
<td>Threats of Violence</td>
</tr>
<tr>
<td>Earthquakes</td>
<td>Disruption of Supply Sources</td>
</tr>
<tr>
<td>Electrical Storms</td>
<td>Fire/Arson</td>
</tr>
<tr>
<td>Floods</td>
<td>Fraud/Embezzlement</td>
</tr>
<tr>
<td>High Winds</td>
<td>Labor Disputes/Strikes</td>
</tr>
<tr>
<td>Hurricanes</td>
<td>Misuse of Resources</td>
</tr>
<tr>
<td>Ice Storms</td>
<td>Riot/Civil Disorder</td>
</tr>
<tr>
<td>Landslides</td>
<td>Sabotage: External and Internal Actors</td>
</tr>
<tr>
<td></td>
<td>Security Breaches</td>
</tr>
<tr>
<td>Snowstorms and Blizzards</td>
<td>Terrorist Assaults Using Chemical, Biological, Radiological, or Nuclear</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>Agents</td>
</tr>
<tr>
<td>Tropical Storms</td>
<td>Terrorist Assaults Using Explosives, Firearms, or Conventional Weapons</td>
</tr>
<tr>
<td>Tsunamis</td>
<td>Theft</td>
</tr>
<tr>
<td>Typhoons</td>
<td>Vandalism</td>
</tr>
<tr>
<td>Wildfires</td>
<td>War</td>
</tr>
<tr>
<td></td>
<td>Workplace Violence</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guidelines for Transportation Emergency Training Exercises

- Guidelines, resource CD-ROM and templates for developing a Progressive Exercise Program, compliant with DHS and ODP requirements.
- Exercise program must address NIMS requirements and Transit Emergency Response Plan and procedures.
- Moves users through the steps necessary to develop and implement a three-year program.
- Practical emphasis on affordable exercises, cost sharing, and grant opportunities.
Survey results: State DOT emergencies most likely to require COOP activation
- Overview of NIMS/NRP requirements.
- Updated discussion regarding new threats to transportation agencies:
  - Chronology of worldwide incidents.
  - Capabilities and intentions of specified terrorist groups.
- Guidance for updating Transit Emergency Response Plans.
- Recommendations for establishing a Transit Incident Management Organization.
- Specialized research and recommendations for mobilizing transit personnel resources to address a range of emergencies, including no-notice evacuations and terrorist events.
  - Over all incident management phases: awareness, prevention, preparedness, response and recovery.
  - Checklist for response to events indicating WMD agent release.
An interactive CD-ROM training course; also available as train-the-trainer and for direct delivery through the National Transit Institute
Sensitivity of the tested device: 10 nanograms (not to scale)
NCHRP Report 525, Vol. 5

1 Establishing a Sensitive Information Management Policy, 1
2 Identifying Sensitive Information, 3
3 Controlling Access to Sensitive Information, 5
4 Keys for Success, 10

Appendix A Florida DOT’s Exempt Documents and Security System Plan Request Form, A-1

Appendix B Texas DOT’s Confidential Safety Information Memorandum, B-1

Appendix C Examples of State Legislation to Exempt Selected Sensitive Transportation-Related Information from State “FOIA” Laws, C-1
TCRP Report 86, Vol. 5
Security-Related Customer Communications and Training for Public Transportation Providers


2. Overview (PowerPoint presentation)


CD-ROM contains all 4 items
<table>
<thead>
<tr>
<th>Vulnerability Issues</th>
<th>Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception</td>
<td>• <strong>Deter</strong>: Discourage attacks by visibility of countermeasures</td>
</tr>
<tr>
<td>Ease of Access</td>
<td>• <strong>Deny</strong>: Increase standoff distance from bridge substructure and tunnel entrances</td>
</tr>
<tr>
<td>Clear zone</td>
<td>• <strong>Dynamic</strong>: Threat-adjustable operational measures (inspections)</td>
</tr>
<tr>
<td>Exposure</td>
<td>• <strong>Detect</strong>: Monitor access to bridge substructure and tunnel portals to minimize time on targets</td>
</tr>
<tr>
<td>Time on target</td>
<td>• <strong>Defend</strong>: Harden key structural elements</td>
</tr>
<tr>
<td>Structure</td>
<td>• Level of protection</td>
</tr>
<tr>
<td></td>
<td>• Level of cost</td>
</tr>
<tr>
<td></td>
<td>• Cost-effectiveness</td>
</tr>
</tbody>
</table>
Checklist:

☐ Does the lighting system meet the transit agency's established security requirement?
☐ Does the lighting system comply with the local building and safety codes?
☐ Have lighting effects on neighboring buildings or private homes been considered?
☐ Are sufficient portable lighting devices available?
☐ Is there a need for specialized spotlighting or infrared (IR) lighting?
☐ If required, is there adequate backup electrical power to support the lighting system?
☐ Is the lighting system clear of any obstructions within 6-feet (minimum) to 20-feet (ideal)?
☐ Is the lighting system properly secured to prevent removal, displacement, modification or theft?
☐ If required, are there adequate signs or language(s) to provide instructions?
☐ Are procedures in place for routine inspection of the lighting hardware?
☐ Have the system operators/maintainers been consulted for input to the selection of this system?
☐ Are there adequate spare parts to support the selected system?
☐ Is Point-of-Contact information readily available for this system?
Figure 3. Overview of the transportation planning process in the context of safety (adapted from FHWA, Citizen’s Guide to Transportation Decisionmaking, FHWA EP-01-013, 2001).
Information Sharing and Analysis Centers: Overview and Supporting Software Features (2004)
### TABLE 22: ACTIVITY OF DUAL PURPOSE K9 TEAM

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Relations and Other Demonstrations</td>
<td>10-20</td>
</tr>
<tr>
<td>Patrol Tours or Routes (two-hour shifts)</td>
<td>500-700</td>
</tr>
<tr>
<td>Narcotics Searches</td>
<td>25-50</td>
</tr>
<tr>
<td>Article Search</td>
<td>25</td>
</tr>
<tr>
<td>Building Search</td>
<td>100</td>
</tr>
<tr>
<td>Suspect Tracking</td>
<td>50</td>
</tr>
<tr>
<td>Victim or Lost Person Tracking</td>
<td>1</td>
</tr>
<tr>
<td>Police Officer Assist Calls</td>
<td>50</td>
</tr>
<tr>
<td>Local Agency Assist Calls</td>
<td>25</td>
</tr>
<tr>
<td>Arrests Made or Supported</td>
<td>12-50</td>
</tr>
<tr>
<td>Trials and Competitions</td>
<td>2</td>
</tr>
</tbody>
</table>
Provides a draft template that contains basic security awareness training in a workbook format that can be redesigned as a pamphlet, glove-box brochure, or other user-specific document.
Notional Surface Transportation Threat Information Forum

- Open Sources
- Trans. Authorities
- Federal Authorities
- Authorized Analysts

Threat information is received via one of two mechanisms:

- Email, pager, fax, phone...
- InfraGard

Content is analyzed, categorized and disseminated according to protocol and shared with relevant stakeholders.

**FIGURE 3: NOTIONAL SURFACE TRANSPORTATION THREAT INFORMATION FORUM**

---

**FIGURE 4: DISTRIBUTED IMPLEMENTATION MODEL**

National Portal
Performing analysis and information sharing with other national entities (e.g., InfraGard)

Regional Portal
Local Public Transportation Authorities

Regional Portal
Local Public Transportation Authorities

Local Public Transportation Authorities
Advisors to the Nation

The National Academies perform an unparalleled public service by bringing together committees of experts in all areas of scientific and technological endeavor. These experts serve *pro bono* to address critical national issues and give advice to the federal government and the public.
Mission of the National Research Council

The National Research Council serves as the “Operating Arm” of The National Academies to:

• Provide authoritative, unbiased advice on issues involving science, technology, and medicine based on scientific facts, not opinion
• Assess the state of current understanding that helps to illuminate public policy decision making
• Survey the broad possibilities of science, engineering, and medicine
• Direct the attention of scientific and technical communities to the value of their knowledge to the achievement of national goals
• Promote cooperation in research, at home and abroad
• Broadly disseminate its work
The National Academies: Consensus Studies, Workshops, and Other Services

What we do
• Consensus studies
• Ongoing activities

How we do it
• Standing boards and committees
• Broad participation in funding

What’s in it for you?
• Interaction through regular briefings to senior staff and participation in standing committees, boards, and roundtables
• Designated liaisons to projects
• Professional development of staff

What do you have to do to get it?
• Support core activities (join and participate)
The National Academies Consensus Study Process

Steps Taken to Ensure Independence and Objectivity

1. Defining the study
2. Committee selection and approval
3. Committee meetings, information gathering, deliberations, and drafting report
4. Report review

Three Types Of Studies

• General Assistance
• Program Review
• Regulatory
Why The National Academies Are Unique

- Volunteers
  - Technical expertise
  - Pro-bono service
- Committee generated reports:
  - Objective and independent
  - Evidence-based consensus
- National Research Council procedures
  - Independence from sponsors
  - Open to public observation and input
  - Rigorous peer review
Report Availability on the Web

- All reports in portable document format (PDFs) are available gratis to researchers in 144 countries (http://www.nap.edu/info/faq_dc_pdf.html)
- PDFs are available gratis to staff; sponsors; Congressional members and staff; members of the National Academy of Science, National Academy of Engineering, Institute of Medicine, or committees; and the media.
- Almost every report is available to read online via our OpenBook technology.
- Almost every title in PDF is available in both whole-book and chapter formats.
Committee on Ensuring the Best Presidential and Federal Advisory Committee Science and Technology Appointments, National Academy of Sciences, National Academy of Engineering, Institute of Medicine

Statement on Biosecurity by the InterAcademy Panel on International Issues (released December 1, 2005)

endorsed by 69 of the world’s academies of science
Ongoing Hazard and Security Activities at The National Academies

– Critical Infrastructure Roundtable
– Disasters Roundtable
– Government-University-Industry Research Roundtable
– Committee on Law and Justice
– Research Associateship Program
– TIGER Committee (Technology Insight – Gauge, Evaluate, and Review)
– Improving Cybersecurity Research in the United States
– The Forum on Microbial Threats
– Microbial Threats to Health--Emergence, Detection, and Response
– Biological Threats and Terrorism
– Pandemic Influenza Research Gaps
– Measures to Enhance the Effectiveness of CDC Quarantine Station Expansion Plans for US Ports of Entry
– Technologies for Transportation Security
– Committee on Critical Transportation Infrastructure Protection
– Radiation Source Use and Replacements
– Committee on Biodefense Analysis and Countermeasures
– The Role of Naval Forces in the Global War on Terror
– News & Terrorism: Communicating in a Crisis
– Committee on Operational Science and Technology Options for Defeating IEDs
Standing Boards and Committees: Division on Engineering and Physical Sciences (DEPS)

**Government Missions**

Space and Aerospace:
- Aeronautics and Space Engineering Board (ASEB)
- Space Studies Board (SSB)

Defense:
- Air Force Science and Technology Board (AFSTB)
- Board on Army Science and Technology (BAST)
- Naval Studies Board (NSB)

**National Infrastructure**

- Board on Energy and Environmental Systems (BEES)
- Board on Infrastructure and the Constructed Environment (BICE)
- Computer Science and Telecommunications Board (CSTB)
- Board on Manufacturing and Engineering Design (BMED)

**Disciplinary Programs**

- Board on Mathematical Sciences & Applications (BMSA)
- Board on Physics and Astronomy (BPA)
- National Materials Advisory Board (NMAB)

**Continuing Program Assessment**

- Army Research Lab Technical Assessment Board (ARLTAB)
- Board on Assessment of Nat’l Institute of Standards & Technology Prog. (NIST)
Key Hazard and Security Activities in Scoping or in Progress at The National Academies

- Assessing Fundamental Attitudes of Life Scientists as a Basis for Biosecurity Education
- Committee on Disaster Research in the Social Sciences
- Government-University-Industry Workshop on Sensitive but Unclassified Information
- Whither Biometrics?
- Improving Cybersecurity Research in the United States
- Technical and Privacy Dimensions of Information for Terrorism Prevention and Other National Goals
- Committee on Basic Research for Countering IEDs
- Assessment of Maintenance Costs for Explosive Detection Systems
- Assessment of Security Technologies for Transportation
- Systems Approach to Building Security Into the Transportation System
- Effective Screening Methods
- Dual Use Technologies & Processes
- Risk-based Routing Decisions for Hazardous Materials
- Counter IED Experimentation, Testing and Evaluation: Responding to a Dynamic Operational Environment
- Forum on Medical and Public Health Preparedness
Key Hazard and Security Activities in Scoping or in Progress at The National Academies (cont.)

- Role of Public Transportation in Emergency Evacuation
- Private Sector Input into Design of DHS’s National Program of Exercises
- Enhancing the Robustness and Resilience of Future Electric Transmission and Distribution in the United States
- Testing and Evaluation of Biological Stand-off Detection Systems
- Protecting Occupants of DOD Buildings from Chemical or Biological Release
- Full System Testing and Evaluation of Personal Protective Equipment Ensembles in Simulated Chemical and Biological Warfare Environments
- Units of Measure for Biological Material in the Testing and Evaluation of Aerosol Detection Systems
- Committee on a New Government-University Partnership for Science and Security
- Medical Isotope Production Without Highly Enriched Uranium
- New Methods for Understanding Systemic Risk in the Financial Sector: Summary of a Workshop
- Interim Report on the Methodology for DHS Bioterrorism Risk Analysis
- Evaluation of the Methodology for DHS Bioterrorism Risk Analysis
- Statistics on Networks: Proceedings of a Workshop
- Strengthening Forensic Science in the United States
Critical Infrastructure Roundtable
First Meeting: January 26-27, 2006

• A series of activities aimed at addressing the most pressing vulnerabilities associated with critical interdependent infrastructure systems

• A dialogue between government, industry, and academia to facilitate development of a long-term strategy for reducing the vulnerability to debilitating failures, whether from terrorist acts, natural disasters, or accidental failures

• A forum for free and open discussion
Institute of Medicine Workshops: Immunization Safety Review

Immunization Safety Review series for the Centers for Disease Control on vaccine safety releases 7 series reports (2002). The project sponsors, CDC and the National Institutes of Health, have responded quickly to many of the policy-analysis and research recommendations. The work of the committee is frequently cited as an authoritative voice to the general public in mass media stories about vaccine safety.
News and Terrorism: Communicating in a Crisis
Workshops in 12 Cities

Department of Homeland Security
Radio-Television News Directors Foundation
The National Academies

- Involve news media in disaster preparation
- Improve quality of information available to the public
- Build relationships between media, government, and S&T communities
- Interactive Program
  - Tabletop scenario play—up to 8 panelists
  - Scenario discussion
  - S&T—presentation and discussion
  - Incident command and preparedness
News and Terrorism: Fact Sheets

- 4 fact sheets, each covering a different threat
  - Biological, chemical, nuclear, and radiological attacks
- 4 page design for newsrooms
- Produced by the National Academies
National Academies Research Associateship Programs

- Postdoctoral and senior research awards are sponsored by more than 30 federal laboratories at over 100 locations in the United States and overseas
- Given for the purpose of conducting research at a specific laboratory chosen by the applicant
- Made to doctoral level scientists and engineers who can apply their special knowledge and research talents to research areas that are of interest to them and to the host laboratories and centers
- Made to Postdoctoral Associates (within 5 years of the doctorate) and Senior Associates (normally 5 years or more beyond the doctorate).
- 480 research associates were in place in 2004
- Over 11,000 Associateships have been awarded since 1954
- Other Fellowship Programs include the Ford pre-and post-doctoral programs, Vietnam Education Foundation fellowships, and State Department Jefferson Science Fellows
<table>
<thead>
<tr>
<th>Research Associateships--Participating Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air Force Research Laboratory (AFRL)</td>
</tr>
<tr>
<td>2. Albany Research Center (ALRC)</td>
</tr>
<tr>
<td>3. Armed Forces Radiobiology Research Institute (AFRRI)</td>
</tr>
<tr>
<td>4. Cold Regions Research and Engineering Laboratory (CRREL)</td>
</tr>
<tr>
<td>5. FAA/Civil Aerospace Medical Institute (CAMI)</td>
</tr>
<tr>
<td>6. Federal Highway Administration/Turner-Fairbanks Highway Research Center (FHWA)</td>
</tr>
<tr>
<td>7. Institute for Water Resources (IWR)</td>
</tr>
<tr>
<td>8. National Energy Technology Laboratory (NETL)</td>
</tr>
<tr>
<td>9. National Institute for Occupational Safety and Health (NIOSH)</td>
</tr>
<tr>
<td>10. National Institute of Standards and Technology (NIST)</td>
</tr>
<tr>
<td>11. National Institutes of Health (NIH)/National Institute of Standards and Technology (NIST)</td>
</tr>
<tr>
<td>12. National Institutes of Health (NIH)</td>
</tr>
<tr>
<td>13. National Oceanic and Atmospheric Administration (NOAA)</td>
</tr>
<tr>
<td>14. Naval Medical Research Center/Naval Health Research Center (NMRC/NHRC)</td>
</tr>
<tr>
<td>15. Naval Postgraduate School (NPS)</td>
</tr>
<tr>
<td>16. Naval Research Laboratory (NRL)</td>
</tr>
<tr>
<td>17. Navy Marine Mammal Program (NMMP)</td>
</tr>
<tr>
<td>18. Pacific Disaster Center (PDC)</td>
</tr>
<tr>
<td>19. US Army Aviation and Missile Command (AMCOM)</td>
</tr>
<tr>
<td>20. US Army Edgewood Chemical and Biological Center (ECBC)</td>
</tr>
<tr>
<td>21. US Army Medical Research and Materiel Command (AMRMC)</td>
</tr>
<tr>
<td>22. US Army Natick Soldier Center-US Army Research, Development and Engineering Command (NSC)</td>
</tr>
<tr>
<td>23. US Army Research Laboratory (ARL)</td>
</tr>
<tr>
<td>24. US Army Research Office (ARO)</td>
</tr>
<tr>
<td>27. US Department of Homeland Security (DHS)</td>
</tr>
<tr>
<td>28. US Environmental Protection Agency Summer Faculty Fellowship Program (EPA/SFFP)</td>
</tr>
<tr>
<td>29. US Environmental Protection Agency (EPA)</td>
</tr>
<tr>
<td>30. US Geological Survey (USGS)</td>
</tr>
<tr>
<td>31. US Military Academy/US Army Research Laboratory (USMA/ARL)</td>
</tr>
</tbody>
</table>
National Academies Research Associateship Opportunities at the Department of Homeland Security (ending 2008)

1. Biological Forensics
2. Biological Systems for Detection, Prevention, and Protection against Foreign Animal Zoonotic Diseases
3. Biosensor Development for Food Protection and Defense
4. Decision Tools for Situation Management
5. Economic Analysis of Terrorist Events
6. Epidemic Modeling of Foreign and Zoonotic Animal Diseases
7. FASTMAN: An Integrated Device for Biodefense Pathogen Detection and Identification
8. Identity and Smart Card Research (HSPD-12)
9. Investigation of Host Range and Cellular Interactions of Foot-and-Mouth Disease Virus
10. Isotopic and Elemental Forensics and Attribution in Nuclear and Biological Warfare Materials
11. Micro/Nano Technology for Botulinum Neurotoxin Sensing in the Food Supply
12. Networked Sensor Systems
13. Neutron Detection and Spectroscopy Tools
14. Novel Decontaminant Formulations and Aerosol Fog Technology for Decontamination of Chemical and Biological Threat Agents with Multiple Applications in Civilian and Military Situations
15. PDA and Mobile Devices
16. Radiation Detection Methodology
17. Radiation Screening at Borders
18. Radionuclide Identification Using Pattern Recognition Programs
19. Security in Mobile Ad Hoc Networks (MANETS)
21. Stable Isotope Forensics and Attribution of Chemical and Biological Agents
22. Standards for DNA Diagnostics
23. Standards for Metrology of Biological Threats
24. Standards for Trace Explosives Detection
25. Studies of Chemical Sensing Materials, Mechanisms, and Microdevices
26. Terrorism Risk Analysis
27. Virtual Environments for Urban Search and Rescue Robot Testing and Training
### Typical Costs for Common Program Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Traditional 18 Month Study</td>
<td>600,000-800,000</td>
</tr>
<tr>
<td>2. Workshop/Study Model (9-12 months)</td>
<td>250,000-400,000</td>
</tr>
<tr>
<td>3. Forum/Roundtable</td>
<td>200,000-600,000/year</td>
</tr>
<tr>
<td>4. Standing Committee</td>
<td>250,000-350,000/year</td>
</tr>
<tr>
<td>5. Oversight and Review</td>
<td>50,000-150,000/year</td>
</tr>
<tr>
<td>6. Fast-track Studies</td>
<td>higher, varies</td>
</tr>
<tr>
<td>7. Planning Meetings</td>
<td>20,000-50,000</td>
</tr>
<tr>
<td>8. IDEA Project</td>
<td>75,000-100,000</td>
</tr>
<tr>
<td>9. Synthesis Study</td>
<td>100,000</td>
</tr>
<tr>
<td>10. Cooperative Research Study</td>
<td>200,000-400,000</td>
</tr>
<tr>
<td>11. Cooperative Research Program</td>
<td>10-35 million/year</td>
</tr>
</tbody>
</table>
What’s in it for you?

- Interaction through regular briefings to senior staff and participation in standing committees, boards, and roundtables
- Designated liaisons to projects
- Professional development of staff

1. Traditional National Research Council studies
2. Roundtables/Forums
3. Workshops
4. Associateships
5. Individually authored reports
6. Standing boards and committees
7. Cooperative Research Programs
Programs of The National Academies Attract Broad Participation and Support

Revenue Applied to 2006: $228 million

- Department of Health and Human Services: 9%
- Department of Defense: 3%
- Department of Transportation: 22%
- National Science Foundation: 7%
- National Aeronautics and Space Administration: 4%
- Social Security Administration: 1%
- Department of Veterans Affairs: 3%
- Environmental Protection Agency: 3%
- Department of Commerce: 3%
- Department of Energy: 3%
- Other Contributions: 2%
- US Agency for International Development: 1%
- Department of Homeland Security: 1%
- Department of the Interior: 1%
- Department of Education: 1%
TRB 2006: 74 Sponsors and Sustaining Affiliates

- State Transportation Departments
- U.S. Department of Transportation
  - Federal Aviation Administration
  - Federal Highway Administration
  - Federal Motor Carrier Safety Administration
  - Federal Railroad Administration
  - Federal Transit Administration
  - National Highway Traffic Safety Administration
  - Research and Innovative Technology Administration
  - Maritime Administration
- National Aeronautics and Space Administration
- U.S. Army Corps of Engineers
- U.S. Coast Guard

- 109 Organizational Affiliates from 18 Nations
- More than 2,900 Individual Affiliates
State DOT Security-Related Research Issues Identified for Consideration by AASHTO SCOTS (August 2007)

1. The Role of Transportation in the ICS Structure
2. Regional Transportation Disaster Response Plan Template
3. Co-Location of Emergency Operations Centers and Intelligent Transportation Centers
4. Contraflow as an Evacuation Strategy
5. Role of Transit in Evacuation Planning and Implementation
6. Licensing and Commercial Vehicle Registration and Security
7. Evaluation of Interoperability Systems Decisions
8. All Hazards Emergency Evacuation Guide for State Departments of Transportation
9. Access to Classified Security Information by State Departments of Transportation and Other Transportation Officials

Source: NCHRP Project 20-59(25) Security Research Plan (DRAFT, August 2007)
Charge

Ponder the unthinkable. Question the status quo. Live in the world as well as in your own nation. Dream of a better future, but contribute to the present. Share your talents. Commune with all people. Be steady friends and bold companions. Address the truly important issues of your time. Be honest in all that you do.

Take your education, your talent, and your energy, and build a nation and a world community that consider knowledge a gift to be shared, a healthy planet a place to be cherished, and human dignity and opportunity fundamental conditions to be enjoyed by all people.

President Charles M. Vest's charge to the graduates, MIT Commencement, June 4, 2004