Terrorism & Enterprise Risk Management

Scenarios & Uncertainty

Enterprise Risk Management Symposium
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Presentation Outline

• Terrorism Risk
  ➢ What do we know 6 ½ after 9/11?
  ➢ Implications for risk managers and ERM

• Terrorism Scenarios
  ➢ Limited utility of traditional tools of risk management

• ERM & The Holistic Approach to Managing Terrorism Risk

• The Market for Terrorism Insurance
WHAT DO WE KNOW?

6 ½ YEARS AFTER 9/11,
IS TERRORISM AN
INSURABLE RISK?
The number of international terrorist attacks fluctuates significantly over time.

Will a drop in the number of attacks breed complacency?

*Approximately half of the attacks from 2004-2006 were in Iraq.
Our Knowledge About Terrorism is Still Remedial; Insurance Markets Limited

- Absence of terrorist attacks on American soil since 2001 has helped to restore stability and confidence in the US economy and commercial insurance markets

- Ironically, the absence of attacks means that what we have learned since 2001 is mostly academic, circumstantial or indirect—garnered from the experience of other countries (e.g., U.K., Spain)
  - Some important experience has been gained in avoiding attacks
  - In contrast, we’ve learned much from the hurricanes of 2004/05

- Hundreds of billions of dollars have been spent on national security (effectively tools of risk management available exclusively to government), but this has a limited practical actuarial effect on the price or availability of terrorism-exposed lines of insurance

- Conclusion: Terrorism is nearly as uninsurable today as it was in the wake of 9/11

- Stability in the market is due almost exclusively to 2 factors:
  - (i) TRIA  (ii) Absence of subsequent attacks since 2001
Implications for Risk Managers & Enterprise Risk Management

• Since 2001 risk managers have been left with three fundamentally difficult or impossible tasks regarding terrorism risk:
  ➢ Identification
  ➢ Quantification
  ➢ Mitigation

• **Identification**: Thousands of vulnerabilities have been identified, but many (and perhaps most) have not

• **Quantification**: Models have been developed that help determine the dollar damage of property and casualty exposures, but how accurate are they (no doubt less so than catastrophe models)?

• **Mitigation**: Corporations and government have spent hundreds of billions to reduce perceived risks, but most are unproven.

• Enterprise Risk Management implies that a holistic approach to such risk be taken, but the practice of ERM in the terrorism context is hampered by huge knowledge gaps
## Terrorism Violates Traditional Requirements for Insurability

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Definition</th>
<th>Violation</th>
</tr>
</thead>
</table>
| **Estimable Frequency** | • Insurance requires large number of observations to develop predictive rate-making models (an actuarial concept known as credibility) | • Very few data points  
• Terror modeling still in infancy, untested.  
• US intelligence infrastructure deeply flawed. |
| **Estimable Severity**  | • Maximum possible/ probable loss must be at least estimable in order to minimize “risk of ruin” (insurer cannot run an unreasonable risk of insolvency though assumption of the risk) | • Potential loss is virtually unbounded.  
• Losses can easily exceed insurer capital resources for paying claims.  
• Extreme risk in workers compensation and statute forbids exclusions. |

Source: Insurance Information Institute
Terrorism attacks are planned, coordinated and deliberate acts of destruction.

- Dynamic target shifting from "hardened targets" to "soft targets"
- Terrorist adjust tactics to circumvent new security measures
- Actions of US and foreign governments may affect likelihood, nature and timing of attack

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<th>Requirement</th>
<th>Definition</th>
<th>Violation</th>
</tr>
</thead>
</table>
| **Diversifiable Risk**           | • Must be able to spread/distribute risk across large number of risks  
                                    | • "Law of Large Numbers" helps makes losses manageable and less volatile  
                                    | • Losses likely highly concentrated geographically or by industry (e.g., WTC, power plants) 
                                    | • Take-up rate low outside most at-risk zones/industries leads to adverse selection problem |
| **Random Loss Distribution/Fortuity** | • Probability of loss occurring must be purely random and fortuitous  
                                      | • Events are individually unpredictable in terms of time, location and magnitude  
                                      | • Terrorism attacks are planned, coordinated and deliberate acts of destruction 
                                      | • Dynamic target shifting from "hardened targets" to "soft targets"  
                                      | • Terrorist adjust tactics to circumvent new security measures 
                                      | • Actions of US and foreign governments may affect likelihood, nature and timing of attack |

Source: Insurance Information Institute
Terrorism Scenarios: Modeling Severity & Frequency

Exposure
- Location
- # & Type Employee

Weapons Selection
- Blast/Explosion
- Chemical
- Biological
- Radiological
- Other (e.g., Dam Failure)

Casualty Footprint
- Physical distribution of intensity of event

Frequency
- Weapon availability
- Target attractiveness
- Relative attractiveness of region

State-by-State Analysis

Sources: Insurance Information Institute based on NCCI Item Filing B-1383 & EQECAT modeling.
Additional Insurability Concerns

- **Information Problems:**
  - Traditional Insurance assumes that emerging issue information is available and shared (Terrorism information sharing is “asymmetric” – Classified data is not shared).

- **Unique Role & Responsibility of Government:**
  - Insurance is designed for policyholders’ insurable interests (Victims of terrorism are mostly surrogate targets for attacks mainly aimed at government, and the government is in a unique position to influence the likelihood of attack based upon foreign policy.)

Source (this slide and next three): *Terrorism, TRIA, and a Timeline to Market Turmoil?* by James Macdonald of ACE USA, presentation before the Real Estate Roundtable, April 22, 2004.
Additional Insurability Concerns

- **Surplus Impairment Risk:**
  - Statutory Accounting requires insurers to set aside reserves for the ultimate liabilities arising from the insurance policies they underwrite. (Insurers are *not allowed to post reserves for losses that have not occurred*. Therefore, insurers are *not allowed to post reserves specifically related to catastrophe losses from natural perils or terrorism until they actually occur*. *As a result, catastrophe losses deplete insurer’s capital & surplus base intended for the security of all policyholders*).

- **Pre-Loss Funding:**
  - Almost all insurance assumes that premiums are paid first, normally at the inception of the policy. (In terrorism programs or pools, private and public sector solutions, such as TRIA, often use a combination of pre-loss and post-loss funding.)
TERRORISM
SCENARIOS

Traditional Tools of Risk Management Can Provide Only Limited Benefits/Insight
Sept. 11 Industry Loss Estimates
($ Billions)

- Life: $1.0 (3.1%)
- Aviation Liability: $3.5 (10.8%)
- Other Liability: $4.0 (12.3%)
- Event Cancellation: $1.0 (3.1%)
- Aviation Hull: $0.5 (1.5%)
- Workers Comp: $1.8 (5.8%)
- Property - WTC 1 & 2: $3.6 (11.1%)
- Property - Other: $6.0 (19.5%)
- Biz Interruption: $11.0 (33.8%)

Current Insured Losses Estimate: $32.5B

Source: Insurance Information Institute
Loss Distribution by Type of Insurance from September 11 Terrorist Attack ($ Billions) (Stated in 2007 Dollars)

- Life: $1.2 (3.2%)
- Aviation Liability: $4.7 (12.7%)
- Other Liability: $1.2 (3.2%)
- Property - WTC 1 & 2*: $5.3 (14.7%)
- Property - Other: $6.3 (17.1%)
- Aviation Hull: $0.6 (1.6%)
- Event Cancellation: $1.2 (3.2%)
- Workers Comp: $2.1 (5.7%)
- Biz Interruption: $11.5 (31.1%)

Total Insured Losses Estimate: $36.9B

*Final settlement amount on claims on the WTC complex itself of $4.55 billion as announced on May 23, 2007 by New York State and Port Authority of New York and New Jersey. Figure is adjusted to 2007 price level. Losses stated in 2001 dollars are $32.5 billion.

Source: Insurance Information Institute
### Top 5 Costliest Terrorist Attacks (by insured property loss*)

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Casualties</th>
<th>Losses in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/11/01</td>
<td>9/11 Terrorist Attacks</td>
<td>2,995 Killed, 2,250 Injured</td>
<td>$32,500</td>
</tr>
<tr>
<td>4/24/93</td>
<td>Bomb Near NatWest Tower in London</td>
<td>1 Killed, 54 Injured</td>
<td>$907</td>
</tr>
<tr>
<td>6/15/96</td>
<td>IRA Car Bomb Near Manchester Mall</td>
<td>0 Killed, 228 Injured</td>
<td>$744</td>
</tr>
<tr>
<td>2/26/93</td>
<td>Bomb in WTC Garage</td>
<td>6 Killed, 725 Injured</td>
<td>$725</td>
</tr>
<tr>
<td>4/10/92</td>
<td>Bomb in London Financial District</td>
<td>3 Killed, 91 Injured</td>
<td>$671</td>
</tr>
</tbody>
</table>

*Includes property, business interruption and aviation hull losses.
Source: Swiss Re; Insurance Information Institute.
### Insured Loss Estimates: Large NBCR Attack ($ Billions)

<table>
<thead>
<tr>
<th>Type of Coverage</th>
<th>New York</th>
<th>Washington</th>
<th>San Francisco</th>
<th>Des Moines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Life</td>
<td>$82.0</td>
<td>$22.5</td>
<td>$21.5</td>
<td>$3.4</td>
</tr>
<tr>
<td>General Liability</td>
<td>14.4</td>
<td>2.9</td>
<td>3.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Workers Comp</td>
<td>483.7</td>
<td>126.7</td>
<td>87.5</td>
<td>31.4</td>
</tr>
<tr>
<td>Residential Prop.</td>
<td>38.7</td>
<td>12.7</td>
<td>22.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Commercial Prop.</td>
<td>158.3</td>
<td>31.5</td>
<td>35.5</td>
<td>4.1</td>
</tr>
<tr>
<td>Auto</td>
<td>1.0</td>
<td>0.6</td>
<td>0.8</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$778.1</strong></td>
<td><strong>$196.8</strong></td>
<td><strong>$171.2</strong></td>
<td><strong>$42.3</strong></td>
</tr>
</tbody>
</table>

Source: American Academy of Actuaries, Response to President’s Working Group, Appendix II, April 26, 2006
## Models of Property and WC losses
*(Insured and Uninsured)*

<table>
<thead>
<tr>
<th>Attack Scenario</th>
<th>WC</th>
<th>Property</th>
<th>Total</th>
<th>Simulated Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-Ton Truck Bomb</td>
<td>$11</td>
<td>$11</td>
<td>$22</td>
<td>$7-$66</td>
</tr>
<tr>
<td>1-Ton Truck Bomb</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>2-21</td>
</tr>
<tr>
<td><strong>NBCR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-kiloton Nuclear Bomb</td>
<td>320</td>
<td>310</td>
<td>630</td>
<td>210-1,900</td>
</tr>
<tr>
<td>Outdoor Anthrax</td>
<td>160</td>
<td>240</td>
<td>400</td>
<td>130-1,200</td>
</tr>
<tr>
<td>Radiological Attack</td>
<td>0.5</td>
<td>62</td>
<td>63</td>
<td>20-190</td>
</tr>
<tr>
<td>Indoor Sarin Attack</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>2-18</td>
</tr>
</tbody>
</table>

*Based on Risk Management Solutions (RMS) models.
Source: RAND, *Trade-Offs Among Alternative Government Interventions in the Market for Terrorism Insurance*
Estimated Workers Comp Insured Losses & Deaths for Terrorist Events

Fatalities

- Sears Tower Airplane Attack: $0.9 billion
- El Paso Energy Truck Bomb: $1.1 billion
- 9/11 Attack: $1.8 billion
- Rockefeller Ctr. Truck Bomb: $7.4 billion
- Nuclear Power Plant Sabotage: $15.4 billion
- New York City Anthrax Release: $91.0 billion

Source: Eqecat, NCCI.
Port Security War Game Estimates $58B Impact from Simulated Terrorist Attack

PORT SECURITY WAR GAME—ECONOMIC IMPACT

Day 1: Ports of Los Angeles and Savannah shut down
Day 4: Customs closes all ports and border crossings
Day 12: U.S. ports reopen
Day 20: Railcar explodes in Chicago; 24 hour stand-down
Day 26: Ports return to normal schedule, inspection rate
Day 52: Vessel backlog cleared

Source: Booz Allen Hamilton

**Under Most Scenarios TRIA Is Dormant But Vital When Triggered**

P&C U/W Loss With and Without TRIA Support

- **Total loss as % of policyholder surplus**

- **TRIA not triggered under approximately 98% of scenarios**

**Chance of an Event**

- 1/10
- 3/4
- 1/2
- 1/4
- 1/20
- 1/25
- 3/10
- 1/50
- 1/100
- 1/500
- 1/1000

**Industry Loss with TRIA**
- 2%
- 2%
- 4%
- 6%
- 12%
- 20%

**Federal Contribution**
- 68%

**Excess of TRIA Limit**

*Under the Terrorism Risk Insurance Extension Act (expired 12/31/07)*

Source: EQECAT, NCCI
ERM & THE HOLISTIC APPROACH TO MANAGING TERRORISM RISK

Preparing for the Unknown
Whose Responsible for Monitoring & Managing Terrorism and Political Risk*

*Respondents to survey could indicate more than one response.

No consistency in the management of terrorism risk
Information Sources Used by Companies to Gather Data on Political Violence*

- International Media Reports: 65%
- B2B Info Sharing & Forums: 49%
- Public Government/Police Briefings: 48%
- Media Local to Trouble Spots: 43%
- Employees: 39%
- Private Government/Police Briefings: 29%
- Research by Private Specialized Cos.: 22%
- Academic Sources: 21%
- NGOs Working in Troubled Areas: 18%

*Respondents to survey could indicate more than one response.

Business rely on more instinct than insight or analysis.
“Traditional” Losses Arising from Terror Attack Scenarios

<table>
<thead>
<tr>
<th>Risk</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>• Cost to repair, rebuild, replace</td>
</tr>
<tr>
<td>Casualty</td>
<td>• Death/injury of workers</td>
</tr>
<tr>
<td></td>
<td>• Death/injury customers &amp; other 3\textsuperscript{rd} parties</td>
</tr>
<tr>
<td>Liability</td>
<td>• Claims of negligence (direct &amp; 3\textsuperscript{rd} party)</td>
</tr>
<tr>
<td>Business Interruption</td>
<td>• Loss of income/extra expense may exceed insurance and company resources</td>
</tr>
</tbody>
</table>

Source: Insurance Information Institute
### “Less Traditional” Losses Arising from Terror Attack Scenarios

<table>
<thead>
<tr>
<th>Risk</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingent Business Inter.</td>
<td>• Upstream damage/dislocations interfere with ability to operate</td>
</tr>
<tr>
<td>D&amp;O</td>
<td>• Shareholders could allege management/directors did not take prudent steps to prevent attack or manage its effects</td>
</tr>
<tr>
<td>Latent Liability</td>
<td>• Claims of disability/disease/death well after the event (e.g., first responders post 9/11)</td>
</tr>
<tr>
<td>Political Risk</td>
<td>• Global political landscape and economic opportunities could shift</td>
</tr>
<tr>
<td></td>
<td>• US government policy influences risk</td>
</tr>
</tbody>
</table>

Source: Insurance Information Institute
Number of Chemical Plants that Could Threaten Nearby People


How is it that the EPA DHS come to such radically different conclusions?

DHS estimate is 98% less than EPA

DHS estimate is 43% less than EPA

Threatens More Than 1,000 People

Threatens More Than 1,000,000 People

Risks of Doing Business Internationally:

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Country</th>
<th>Business Partner Score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Afghanistan</td>
<td>10.0</td>
</tr>
<tr>
<td>2.</td>
<td>Equatorial Guinea</td>
<td>10.0</td>
</tr>
<tr>
<td>3.</td>
<td>Tajikistan</td>
<td>10.0</td>
</tr>
<tr>
<td>4.</td>
<td>Syria</td>
<td>10.0</td>
</tr>
<tr>
<td>5.</td>
<td>Iraq</td>
<td>8.0</td>
</tr>
<tr>
<td>6.</td>
<td>Serbia</td>
<td>7.7</td>
</tr>
<tr>
<td>7.</td>
<td>Colombia</td>
<td>7.0</td>
</tr>
<tr>
<td>8.</td>
<td>Angola</td>
<td>7.0</td>
</tr>
<tr>
<td>9.</td>
<td>Venezuela</td>
<td>7.0</td>
</tr>
<tr>
<td>10.</td>
<td>Vietnam</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Business partner risk is the risk of entering into a transaction, project or other form of relationship with a business partner.

*Business Partner Score is a mean score, out of a maximum of 10, derived from three components: venture halted or modified, transparency and integrity.

Source: Aon 2007 Political and Economic Risk Map; The Risk Advisory Group
**“Non-Traditional” Losses Arising from Terror Attack Scenarios**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Risk</td>
<td>• Infiltration, disruption or disruption</td>
</tr>
<tr>
<td></td>
<td>• Could involve your IT, or up/downstream</td>
</tr>
<tr>
<td>Investment Risk</td>
<td>• Terrorist attack will likely negatively influence investment opportunities, possibly for extended period</td>
</tr>
<tr>
<td>Reputational Risk</td>
<td>• Perception of vulnerability; Botched recovery; treatment of stakeholders issues</td>
</tr>
<tr>
<td>Regulatory Risk</td>
<td>• Regulator/Govt. reaction could impair business prospects, raise costs</td>
</tr>
<tr>
<td>Economic Risk</td>
<td>• State of the economy pre/post-attack influences performance</td>
</tr>
</tbody>
</table>

Source: Insurance Information Institute
Risk Management Reactions to Political Violence and Terrorism*

<table>
<thead>
<tr>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase IT Security</td>
<td>41%</td>
</tr>
<tr>
<td>Avoid Investment in Certain Regions</td>
<td>37%</td>
</tr>
<tr>
<td>Review Business Partner Selection Criteria</td>
<td>30%</td>
</tr>
<tr>
<td>Increase Insurance</td>
<td>23%</td>
</tr>
<tr>
<td>Change Travel Policy</td>
<td>22%</td>
</tr>
<tr>
<td>Increase Employee Travel Spending</td>
<td>21%</td>
</tr>
<tr>
<td>Not Pursue a Promising Business Activity</td>
<td>20%</td>
</tr>
<tr>
<td>Increase Security Spending Significantly</td>
<td>16%</td>
</tr>
<tr>
<td>Increase Supply Chain Resilience</td>
<td>16%</td>
</tr>
<tr>
<td>Cease/Sell-off Ops in Certain Region</td>
<td>8%</td>
</tr>
<tr>
<td>Relocate Ops Within Region</td>
<td>7%</td>
</tr>
</tbody>
</table>

*Respondents to survey could indicate more than one response.


Business globally have implemented a wide variety of responses to terrorism and political violence.
THE MARKET FOR TERRORISM INSURANCE

TRIA Remains a Runaway Success
Insurance IndustryRetention
Under TRIA ($ Billions)

- Individual company retentions fixed at 20% for 2007-2014
- Above the retention, federal govt. pays 85% for 2007-2014

Source: Insurance Information Institute
Terrorism Coverage
Take-Up Rate Rising

Terrorism take-up rate for non-WC risk rose through 2006 and continues to rise.

Take-up rate exceeds 60% in Midwest, Northeast

Source: 2006 Marsh Marketwatch Report; Insurance Information Institute
**Terrorism Coverage: Take-Up Rates by Region**

Terrorism take-up rates are highest in the Northeast and Midwest.

Source: 2006 Marsh Marketwatch Report; Insurance Information Institute
Terrorism Coverage:
Take-Up Rates by Industry, 2006

Take-up rates are much higher than just a few years ago

Source: 2006 Marsh Marketwatch Report; Insurance Information Institute
Some 60% of firms with TIV between $500 million and $1 billion buy terror coverage.

*Terrorism Coverage Take-Up Rates by Total Insured Value (TIV)*

*Does not include firms that buy coverage through package policies.

Source: 2006 Marsh Marketwatch Report; Insurance Information Institute
Terrorism Premium as a Percentage of Property Premium by TIV*

2006 saw modest reductions for all companies, except those with TIV between $100 million and $500 million.

RANGE

Highest = Financial Institutions = 8.0%
Lowest = Construction = 2.7%

Source: 2006 Marsh Marketwatch Report; Insurance Information Institute

*TIV = Total Insured Value
Terrorism Premium as Percentage of Property Premium, by Industry

Source: Marsh, Inc.
Terrorism premiums have generally fallen relative to general property insurance costs.
Terrorism Pricing: Median Rates by Region (per $1 Million TIV)

Terrorism insurance continues to be most expensive in the Northeast based on premium rate, though the variation by region has narrowed.

Source: Marsh, Inc. 2006 Market Conditions and Analysis; Insurance Information Institute
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