Critical Infrastructure Protection Metrics and Tools; Maritime Security Risk Analysis Model (MSRAM) [June 5-7, 2008] [video]
Maritime Security Risk Analysis Model (MSRAM)

“Balancing resources to risk”

Presentation for the
Critical Infrastructure Protection Workshop
The Center for Homeland Defense and Security
June 2008

Presented by LCDR Brady Downs, USCG
Domestic Port Security Evaluations Division (CG-5142)
Directorate of Assessment, Integration and Risk Management
US Coast Guard Headquarters, Washington, D.C.
<table>
<thead>
<tr>
<th>Period</th>
<th>Methodology</th>
<th>Focus</th>
<th>Improve</th>
<th>Supported</th>
<th>Future updates</th>
<th>GAO</th>
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<td>2001 - 2005</td>
<td>PSRAT</td>
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<td>• Support COTP Risk Security Management</td>
<td>• Consistency &amp; threat</td>
<td>• COTP/Sectors</td>
<td>• Address full scope of threat (Transfer &amp; CBRN Threat)</td>
<td>Good start – improvements needed</td>
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<td>• Consequence data to support Operation Neptune Shield</td>
<td>• Operation Neptune Shield</td>
<td>• Improve Consequence/Vulnerability analysis</td>
<td>Addresses 13 of 18 Critical Infrastructure &amp; Key Resources</td>
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<td>• Port Risk data supported Port Security Risk Assessments</td>
<td>• Transportation Worker Identification Card</td>
<td>• Address 18 of 18 CIKR</td>
<td>Most efficient tool for risk management in DHS</td>
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<td>• Combating Maritime Terrorism</td>
<td>• Support DHS, OGA, States, &amp; other nation’s risk analysis</td>
<td>Maritime Security only area to receive the grade of “Substantial Progress”</td>
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<td>2006</td>
<td>MSRAM 1</td>
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<td>• Support Field &amp; Headquarters</td>
<td>• Consistency &amp; threat</td>
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<td>• Addresses threat element from ICC &amp; consistency issues</td>
<td>• Operation Neptune Shield</td>
<td>• Improve Consequence/Vulnerability analysis</td>
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<td>• Improve training, support, &amp; data review/validation</td>
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<td>MSRAM +</td>
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<td><strong>Supported:</strong></td>
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OUR MISSION

- Prevent terrorist attacks within the United States - (PREVENT)
- Reduce America’s vulnerability to terrorism - (PROTECT)
- Minimize the resulting damage if prevention fails - (RESPOND)
- Recover from attacks that do occur - Ensure economic security - (RECOVER)

Homeland Security Act of 2002
The complexity of the marine transportation system and the maritime domain creates a unique opportunity for the Coast Guard due to the vast array of critical infrastructure, assets, key resources, systems, & networks that make up our nation’s riverports, seaports and the maritime domain.

Maritime domain is a microcosm of the national economy. Risk crosses all 18 DHS Sectors

Similar situation for Localities, Cities, State, National, International risk analysis
The MSRAM was designed to enhance security and reduce the risk of terrorism by identifying and prioritizing critical infrastructure, key resources and high consequence transits and events across sectors using a common risk methodology, taxonomy and metrics to measure security risk at the local, regional, and national levels.

Support Senior Leadership risk based decision making process
MSRAM Security Risk Concept

Threat = Capability X Intent (with confidence)

Vulnerability = Achievability X System Security X Target Hardness

Consequence = Death and Injury, Primary and Secondary Economic, Environment, National security, Symbolic Impacts X (Less Response Capability) And Secondary Economic Impact

Mitigated by Interdiction Capability

Mitigated by Response Capability

\[ \text{Risk} = \text{Threat} \times \text{Vulnerability} \times \text{Consequence} \]
### MSRAM Risk Components T*C*V=R

#### Scenario
- **Target / Asset**
- **Attack Mode**

#### Threat Attack Probability
- **Intentions & Confidence**
- **Capability & Confidence**
- **Geographic Threat**

#### Scenario Consequence
- **Primary Consequence**
- **Secondary Economic Impact**

#### Vulnerability
- **Achievability**
- **System Security - Owner/Operator**
- **System Security - LEA**
- **System Security - USCG**
- **Target Hardness**

#### X
- Risk
## Target Factors
- Target name
- Target Class
- Availability
- Maximum Consequence
- USCG Role (Lead, Support, Other)
- Maritime Transportation Security Act Regulated
- Area
- Captain of the Port
- CG Station
- Port
- Waterway
- Latitude / Longitude
- County (link to FEMA regions)
- River Mile Marker
- DHS MCI/KR sector
- DHS Grant Port

- Ability to add additional DOD target factors as necessary

## Scenario Factors (Scenarios = Target + Attack Mode)
- Threat
  - Intent
  - Capability
- Consequence
  - Death/Injury
  - Primary Economic
  - Secondary Economic (Recoverability/Redundancy)
  - Environmental
  - National Security
  - Symbolic
  - Response Capability (Owner/Operator, 1st Responders, USCG)
- Vulnerability
  - Achievability
  - System Security (Owner/Operator, LE, USCG)
  - Target Hardness
- Risk
  - Organic: 24 hour, steady state owner/operator response
  - Mitigated: risk including impact of USCG & LEA
  - Primary: primary economic impact only
  - Total: risk including secondary economic
## Depth of MSRAM Risk Information
Over 74,000 Judgements

<table>
<thead>
<tr>
<th>Target Categories/Classes</th>
<th>Attack Modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barge</td>
<td>Attack by Hijacked Vessel</td>
</tr>
<tr>
<td>10 classes</td>
<td>Boat Bomb</td>
</tr>
<tr>
<td>Facility</td>
<td>Boat Bomb (while vessel is present)</td>
</tr>
<tr>
<td>14 classes</td>
<td>Car/Truck Bomb</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Hijacking of Vessel</td>
</tr>
<tr>
<td>7 classes</td>
<td>Passenger/Passerby Explosives/Improvised Explosive Devices</td>
</tr>
<tr>
<td>Key Asset</td>
<td>Sabotage</td>
</tr>
<tr>
<td>8 classes</td>
<td>Standoff Weapon Launched from Water and Land (including Man-Portable Air Defense Weapon)</td>
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<tr>
<td>Other</td>
<td>Swimmer/Diver/Underwater Delivery Systems</td>
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<tr>
<td>2 classes</td>
<td>Terrorist Assault Team (Hostage Taking)</td>
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<tr>
<td>High Population</td>
<td>Attack by Hijacked Large Aircraft</td>
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<tr>
<td>Events</td>
<td>Small Suicide Aircraft</td>
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<tr>
<td>Vessel</td>
<td>Chemical, Biological, Radiological, Nuclear</td>
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<tr>
<td>21 classes</td>
<td>Cyber Attack</td>
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<td>Mines (Aquatic) &amp; Mines (Land)</td>
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<td></td>
<td>Transfer of Terrorist, weapons/materials</td>
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<td></td>
<td>Ability to add additional DOD attack modes as necessary</td>
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</table>

**MSRAM target classes**
link to DHS sectors
MSRAM – Synergizes the Use of Other Risk Tools, Models, and Assessments

**Threat**
- ICC Strategic Threat Analysis
  - Intent w/Confidence
  - Capability w/Confidence
  - Time Horizon when terrorist Capability Acquired

**Consequence**
- Studies (Blast & Consequence)
- Plans (AMSP)
- Tools (Chemtap, Oiltap, CAMEO, Aloha, Marplot)
- Consequence Data (RMP, GCOA, HASZUS)

**Vulnerability**
- Assessments (AMSC, VSP, FSP, RAM-D, MAST, PSA, RAMCAP, CRs, SAV, PIVA, HLS-CAM, JISVA, FHWA).
- Tools (ACAMS, ViSAT)
- Studies / Grants (BZPP)
- Workgroups (SME)

**MSRAM Risk Calculator**

**Outputs**
- Prioritized Risk Ranking - Common Risk Model (NADB)
- Security Risk Profiles
- Risk Drivers
- Data for Risk Management Analysis
- Risk Management Priorities

**Analyze & Exercise**
- Strategic Risk Analysis Process
- Protective Security Analysis Center (PSAC)
- National Infrastructure Simulation and Analysis Center (NISAC)
- Coast Guard R & D Center / National Labs

**Exercises:** PREP, PORTSTEP, AMSTEP, TOPOFF
MSRAM Data Review Process
Local, Regional and National

1. COTP/Sector Assessment with AMSC Input - Identifies risk profile for individual targets
   - Green = Data is at the Security Sensitive Information level

2. District Review Provide consistency/normalization between Sectors

3. Area Review Provide consistency/normalization between Districts

4. HQ Assessment, Review & Analysis Provide consistency/normalization between Areas
   - RED = Data is at the Secret level

Review and Direction
Previous Consequence-Based Approach

One Dimension Consequence Scale
MSRAM creates a Risk-Based Risk-Informed Security Profile

- Bridge - Boat Bomb
- Ferry 150 -1000 – Boat Bomb
- Petroleum Refinery – Car/Truck Bomb
- Oil Tanker – Boat Bomb
- Nuclear Power Plant – Car/Truck Bomb
- LPG Tanker - Boat Bomb
- Cruise Ship – Car/Truck Bomb
- Cruise Ship – Attack By Hijacked Vessel
- LPG Tanker – Stand-Off Weapon
- Cruise Ship – Attack By Hijacked Vessel
- Bridge – Attack By Hijacked Vessel
- High Capacity Ferry Terminal- Car/Truck Bomb
- High Capacity Ferry – Car/Truck Bomb
- Cruise Terminal – Car/Truck Bomb
- CDC Facility – Car/Truck Bomb
- Cruise Ship - Boat Bomb
- High Capacity Ferry – Boat Bomb
- Cruise Terminal – Boat Bomb
- Oil Tanker – Boat Bomb
- Cruise Ship – Boat Bomb
- LPG Tanker – Stand-Off Weapon
- Bridge – Boat Bomb

Likelihood (Threat * Vulnerability)

LOW Consequence

LOW

HIGH

HIGH Consequence
MSRAM creates reports for analysis
Risk by Target Class

Use reports to quickly scan for risk by target classes

<table>
<thead>
<tr>
<th>TARGET</th>
<th>DOTP</th>
<th>PORT</th>
<th>PORT</th>
<th>AGGREGATE</th>
<th>CONSEQUENCE - PRIMARY</th>
<th>CONSEQUENCE - SECONDARY</th>
<th>VULNERABILITY</th>
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</thead>
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<td>SCENARIO SCORING - CONSISTENCY</td>
<td>RISK BY TARGET CLASSES</td>
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<td>Agricultural and Food</td>
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<td>Car/Truck Bomb</td>
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<td>PORT OF ORANGE</td>
<td>Port Arthur</td>
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<td>Bridges and tunnels (HWY/RR)</td>
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<td>Boat Bomb</td>
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<td>Bridges &amp; Tunnels</td>
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SAMPLE DATA
Comparison of Chemical facilities

ILLUSTRATIVE SAMPLE DATA

Chlorine #1  Chlorine #2  Chlorine #3  Ammonia #1  Ammonia #2  Ammonia #3  LNG #1  LNG #2  LNG #3

Chlorine  Ammonia  LNG
MSRAM Analysis – Compare Risk Density by State

Risk Density for Type Target by Gulf State (Illustrative)

- **Other**
- **Vessels**
- **Key Assets**
- **Infrastructure**
- **Facilities**
- **Barges**

SAMPLE DATA
MSRAM change case supports Risk Mitigation Decision Strategies

Likelihood (Threat * Vulnerability)

Low

High

Consequence

Low

High

Mitigation strategies implemented to reduce risk

Risk Group 1

Risk Group 2

Risk Group 3

Response / Recovery

Regulatory Regime

Prevention / Protection
MSRAM National Risk Profile

Response/Recovery

X# target represent top 60% of the total risk

X# target represent top 40% of the total risk

X# target represent top 20% of the total risk

18,000+ targets represent 100% of the total risk

Regulatory Regime

Prevention/Protection

LIKELIHOOD
(Threat * Vulnerability)

CONSEQUENCE

18,000+ targets represent 100% of the total risk
Senior Leadership can utilize MSRAM to illustrate **High Risk Scenarios by Attack Mode locally, regionally, nationally**

If we receive a threat advisory for high capacity passenger vessels?

This slide illustrates MSRAM’s ability to support decisions in times of crisis by identifying what scenarios are the highest risk, the risk drivers and where they are located.
MSRAM assists to identify where are the greatest risks and risk drivers are in your AOR

Geographic distribution of high risk attacks in Sector Miami

This slide illustrates the geographic distribution of high risk scenarios within an AOR. The highlights the richness of MSRAM risk information and how it can be used to inform the operational commanders

Attack Modes
- Car / Truck Bomb
- Boat Bomb (while vessel is present)
- Swimmer/Diver/Underwater Delivery Systems
- Standoff Weapon Launched from Water
- Attack by Hijacked Vessel
MSRAM supports Local, Regional and National applications

- **Strategic Uses**
  - Provides an understanding of:
    - the types of targets and attacks that present the highest risk
    - the risk-based distribution of targets regionally (Risk Density)
  - Strategic planning outcomes measure
  - Support of Strategic planning effort-Combating Maritime Terrorism (CMT)
  - Transportation Worker Identification Credential (TWIC) implementation
  - DHS Port Security Grant Process (risk formula and grant evaluation)
  - National Maritime Security Risk Assessment (NMSRA)
  - National Maritime Threat Assessment Methodology
  - Strategic Operational Planning Process (SOPP)

- **Operational Uses**
  - Operation Neptune Shield
  - Geospatial Risk Map
  - Area Maritime Security Plans (AMSP) / Action Plans / Contingency plans
  - Mounted Automatic Weapon allocation project

- **Tactical Uses**
  - Incident Command System (ICS) risk management cycle
  - National Special Security Event (NSSE)
  - Communication tool amongst stakeholders-AMS Committee
  - Supports updates to NVIC 09-02 AMSPs and 03-03 Facility security plans
Global Supply Chain Security Risk

MSRAM can assist in determining the risk & interdiction capability along critical nodes.

24 Hour Advance Shipment Notice
CBP Booking Information CTPAT
International Ship & Port Facility Compliance
96 Hour Notice of Arrival
Container Security Initiative

DNDO, Deep Water, Domain Awareness

Entry State / Local

Factory Truck, Rail, Barge Transport Distribution Center Truck, Rail, Barge Transport Port of Lading Water Conveyance Trans-shipment Port Air Conveyance Port of Entry Truck, Rail, Barge Transport Distribution Center

Critical Network Analysis Transportation Security Security Risk Analysis Regulatory Regime Enforcement

MSRAM

DR. Lewis
CRITICAL INFRASTRUCTURE PROTECTION IN HOMELAND SECURITY DEFENDING A NETWORKED NATION

Deterrence Protection and Prepartion

Code of Federal Regulations CFR

46 CFR 401, 402, 403

Enforcement

Transportation Security
Unified Risk Coast Guard Missions

Expected Residual Loss (Risk) that the CG has the ability to influence due to:

*All incidents* (excluding transfer of WMD)

**Important Note:** These are not suggested resourcing profiles! Context is required before these profiles are able to meaningfully inform planning and budgeting decisions.

MSRAM data contributes to this risk profile
Maritime Security Risk Analysis Model

Support Senior Leadership risk based/informed decision making process

“In the absence of emotion and Political influence
Risk is where risk is.”

Quote by LCDR Brady Downs, USCG during Congressional briefing 2007

Questions?  Topics for Discussion!