Low-Latitude Chokepoints and Vulnerabilities

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18 NOV 2014

5th Annual Maritime Risk Risk Symposium

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Many (maritime) systems that we care about can be represented using *flows* (on networks).
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For more information:


What about global maritime choke points?
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Flows that we often want to interdict:

• Smuggling
  – Narcotics
  – WMD

• Suicide attacks
Interdicting Self-Propelled Semi-Submersibles (SPSS)

- Current SPSS interdiction relies on actionable intelligence
- Two basic ways to improve odds
  - Improve intelligence
  - Improve maritime domain awareness
  - Optimizes the employment of maritime search platforms
  - Value of intelligence captured by number of possible entry and goal positions
  - Success defined as detection and classification

“What worries me [about the SPSS] is if you can move that much cocaine, what else can you put in that semi-submersible. Can you put a weapon of mass destruction in it?”  Navy Adm. Jim Stavridis, Commander, USSOUTHCOM
Interdicting Self-Propelled Semi-Submersibles (SPSS)

Narcotrafficking Transit Zone

- 60x60 nm cells
- X – non available for navigation
- G - SPSS goal cells
- E - SPSS entry cells
- 1 - Cells with sparse shipping density
- 2 - Cells with moderate shipping density
- 3 - Cells with high shipping density

Source: USSOUTHCOM

Interdicting Attack: Maritime Port Security

Threat: Small boat attacks on high-value maritime assets.

Attacker is trying to avoid small defender boats that operate in teams.

The attacker observes our fixed defensive preparations, and decides if/how to proceed with attack....
Attacker’s problem: find attack paths for multiple, simultaneous attackers that minimize getting stopped.

Defender’s problem: preposition radar and small boats to maximize early detection.
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  - Narcotics
  - WMD
- Suicide attacks

Flows that we often want to ensure:

- Transportation
- Energy (fuels)
- Electricity
- Communications
- Water
8 West Coast Seaports

Oakland
Los Angeles
Long Beach
San Diego
Punta Colonet
Seattle
Tacoma
Portland

10 Metropolitan Areas

Detroit
Chicago
Boston
New York City
Washington, D.C.

Model effects of a Transportation Security Incident (TSI) upon the MTS and West Coast container industry

- Oakland earthquake
- Closure of LA/LB
- 10-day ILWU lockout

System measures

- Incremental costs
- Vessel queue time

90% of U.S. cargo imports/exports are handled by 14 ports

84 Transportation Analysis Zones (TAZs)

Maritime & Intermodal Transportation System

Include both rail and road transport

Measures cost in delays (TEU-days)

Scenarios Analyzed:

• 7.8 Magnitude SoCal Earthquake
  – LA/LB ports closed for 14 days

• ILWU Lockout
  – West Coast Ports closed for 14 days

• Atlantic Hurricane
  – Savannah & Charleston closed for 14 days

• Security Incident in Oakland
  – 30% reduced capacity

• Attacks on intermodal transport system

Case Study: Inland Marine Transportation System

References:

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How we assess and improve operational resilience:

1. Model the flows (operation) under normal circumstances. (Key: think like an operator!)

2. Consider disruptions and consequences
   - scenarios of interest
   - probabilistic (monte carlo)
   - worst case (attacker-defender)

3. Consider potential mitigations
   - effectiveness and cost
Recent NPS Theses on Port Resilience

- LT Luis A. Bencomo, USN, “Modeling the effects of a transportation security incident on the commercial transportation system,” M.S. Thesis in OR, September 2009.
- CDR Constantino F. De la Cruz, USN, "Defending the Maritime Transport of Cargo for the Hawaiian Islands," M.S. Thesis in OR, NPS, March 2011.
- LT Jason V. Ileto, USN, "Improving Resiliency of the Petroleum Supply Chain for the Hawaiian Islands", M.S. Thesis in OR, NPS, March 2011.
- Capt Joshua J. Onuska, USMC, "Defending the Pittsburgh Waterways against Catastrophic Disruption," M.S. Thesis in OR, NPS, June 2012.

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two distinct types of problems

• system *interdiction*  
  – some or all of the system flows are stopped  
  – example: dependence on MTS means interdiction can have a ripple effect across the economy  
  – chokepoints = vulnerabilities

• system *hijacking*  
  – system flows continue as normal, but result in behavior that was not intended; can be worse than interrupting flows  
  – examples:  
    • illicit or dangerous cargo in container traffic  
    • disease in global travelers  
  – challenge: can’t afford to stop system flows  
  – chokepoints = opportunities to measure, monitor, mitigate

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concluding thoughts

- These flows (and networks) have been shaped by economic and technological forces
- They continue to evolve
- How do potential changes in the structure of the network change the chokepoints?
  - Artic passage?
  - New canals?
  - New classes of ships?
  - New supplies and/or demands?
- Will these changes make us more resilient?