Assessing the Risk of Toxic Chemical Releases During Transportation

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Homeland Security

Transportation Risk

Chemical	Road	Rail	Water	Total	% of Total
Ammonia (NH_3)	5,793,000	3,470,592	1,718,974	10,982,566	52.8%
Chlorine (Cl_2)	724,000	3,750,372	137,202	4,611,574	22.2%
Sulfuric Acid (H_2SO_4)	257,000	207,560	2,057,721	2,522,281	12.1%
Acrylonitrile (C_3H_3N)	29,000	277,200	671,474	977,674	4.7%
Ethylene Oxide (C_2H_4O)	106,000	671,260	1,132	778,392	3.7%
Hydrogen Fluoride (HF)	29,000	264,560		293,560	1.4%
Sulfur Dioxide (SO_2)	72,000	172,480	361	244,841	1.2%
Hydrogen Chloride (HCl)	2,000	8,400	166,027	176,427	0.8%
Hydrogen Cyanide (HCN)	33,000	31,600		64,600	0.3%
Bromine (Br_2)	61,000			61,000	0.3%
Nitric Acid (HNO_3)	3,000	35,800	44	38,844	0.2%

- Chemicals are essential to modern life
- *Hundreds of millions* of tons are transported every year by road, water, rail
- Chemicals are heavily trafficked in bulk through High-Threat Urban Areas (HTUA)
- A chemical in transport is an potential target for terrorism:
  - No need for acquisition
  - High toxicity of many industrial chemicals creates the potential for mass casualties in large-scale releases
  - Built-in delivery system to the target (hijack or attack in place)
  - Generally limited security/countermeasures available

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Transportation Risk

- In the chemical supply chain, transportation is identified as having a significant risk.

Risk = Threat x Vulnerability x Consequences

- Risk is elevated in Transportation due to simultaneous increases in Probability *and* Consequences:
  - Increased availability of chemicals in transport (Threat x Vulnerability)
  - Transport through High Threat Urban Areas magnifies potential loss of life/ property (Consequences)

Addressing Transportation Risk

- CSAC is addressing Transportation Risk through multiple parallel and synergistic programs:

Quantifying Risk

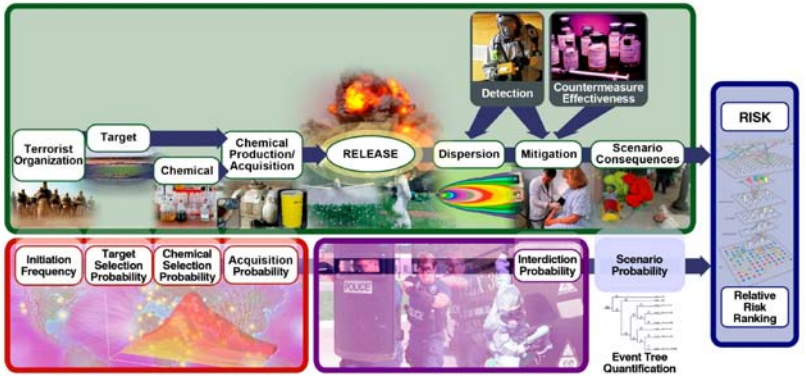
- The Chemical Terrorism Risk Assessment (CTRA) and Chemical Infrastructure Risk Assessment (CIRA) utilize probabilistic risk assessments to quantify and prioritize chemical risk

Analyzing Risk

- CTRA and CIRA are used to analyze and perform sensitivity studies of the high-risk components of chemical transportation
  - Limited resources can be most appropriately focused
  - Impediments to free chemical transport can be minimized
- The Jack Rabbit and Modeling Large-Scale (MLS) Chemical Transport Releases projects are improving prediction and analysis capabilities

Lowering Risk

- The ISHC program seeks to identify, quantify, & compare safer alternatives in chemical processes
- Risk mitigation strategies can be identified and analyzed across interconnected CSAC programs



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