REDUCING THE THREAT OF IMPROVISED EXPLOSIVE DEVICE ATTACKS BY RESTRICTING ACCESS TO EXPLOSIVE PRECURSOR CHEMICALS
Background

- Terrorists and other malicious actors employ large- and small-scale IEDs
  - Vehicle-borne IEDs (VBIEDs): ~40-10,000(s) lbs.
  - Person-borne IEDs (PBIsEDs): ~1-40 lbs.
- Materials, devices, and instructions for producing IEDs are highly accessible
- Recent IED attacks in Boston, Paris, Brussels, New York, Manchester, and Sri Lanka - demonstrate the ongoing threat

Proposed Ammonium Nitrate Security Program (ANSP) focuses on just one of many precursor chemicals, other policy options merit consideration.
NAS Areas of Study

1. Review literature and data, both domestic and international, to identify and list chemicals that have been used or are susceptible to use in IEDs, either in U.S. or internationally

2. Analyze movement of chemicals through commercial supply chains and assess vulnerabilities and weaknesses of supply chains with respect to misappropriation

3. Use information obtained in Steps 1 and 2 to develop priority ranking of chemicals to consider for control

4. Describe and assess existing control measures, both in U.S. and internationally, for priority chemicals

5. Suggest controls that might be effective for voluntary or regulatory strategy and discuss security, economic, and other tradeoffs
Precursor Chemicals

**Synthesis Chemicals**
- Acetone
- Aspirin
- Erythritol
- Ethylene Glycol
- Glycerol
- Hexamine
- Hydrazine
- Mannitol
- Methanol
- MEK
- Pentaerythritol
- Phenol
- Sodium Azide
- Urea
- UAN Solution

**Strong Acids**
- Sulfuric Acid
- Hydrochloric Acid
- Nitric Acid

**Weak Acids**
- Citric Acid
- Acetic Acid
- Ascorbic Acid

**Oxidizers**
- Hypochlorite Salts (Ca²⁺/Na⁺)
- Chlorate Salts (Na⁺/K⁺)
- Hydrogen Peroxide
- Metal Peroxides (Ba²⁺/Na⁺)
- Nitrate Salts (Ca²⁺/Na⁺/NH₄⁺/K⁺)
- Nitrite Salts (Na⁺/K⁺)
- Perchloric Acid
- Perchlorate Salts (Na⁺/NH₄⁺/K⁺)
- Potassium Permanganate

**Organic Materials**
- Diesel
- Kerosene
- Mineral Oil
- Motor Oil
- Sawdust
- Vaseline

**Inorganic Materials**
- Aluminum Powder
- Aluminum Paste
- Antimony Trisulfide
- Charcoal
- Magnalium Powder
- Magnesium Powder
- Red Phosphorus
- Sulfur
- Titanium Powder
- Zinc Powder

**Food Products**
- Artificial Creamer
- Black Pepper
- Black Seed
- Cinnamon
- Cocoa
- Flour
- Honey
- Icing Sugar
- Powdered Drink Mix

**Energetic Organic Compounds**
- Nitrobenzene
- Nitromethane

**Detonators**
- Mercury Fulminate
- Lead Azide
- Silver Azide

**Person-Borne IEDs**
- AN/Al
- AN/NM
- Flash Powder
- R-Salt
- KCIO₃/Fuels

**Vehicle-Borne IEDs**
- AN/FO
- CAN/Al
- CAN/Food
- Urea Nitrate

**Fuels**
- Organic Materials
- Diesel
- Kerosene
- Mineral Oil
- Motor Oil
- Sawdust
- Vaseline

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- Aluminum Paste
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- Zinc Powder

**Historical examples of use cases**

**Aircraft Bombings**
- Plastics
- RDX
- Tetryl
- TNT
- PETN
NAS Study Results

• Eliminated some precursor chemicals on basis of amounts of use and ubiquity
• Ranked remaining 28 precursor chemicals on basis of three criteria
  – Utility in VBIEDs and/or PBIEDs (V/P, V, or P)
  – History of prior use (Yes (Y), No (N))
  – Role in synthesis (Independent (I), Dependent (D))
• Assigned chemicals to Group A, B, or C
  – Precursor chemicals in Group A generally satisfy all three criteria (V/P, Y, I) and pose most immediate threat
  – Evolving threat environment could elevate status of chemicals in Groups B and C

<table>
<thead>
<tr>
<th>Group A</th>
<th>V/P</th>
<th>Y</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Calcium ammonium nitrate</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Nitromethane</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Potassium chlorate</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Potassium perchlorate</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>V/P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Urea ammonium nitrate solution</td>
<td>V/P</td>
<td>N*</td>
<td>I</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Group B</th>
<th>V/P</th>
<th>N</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium nitrate</td>
<td>V/P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>V/P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Potassium nitrate</td>
<td>V/P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Potassium permanganate</td>
<td>P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Sodium nitrate</td>
<td>V/P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Sodium nitrite</td>
<td>P</td>
<td>Y</td>
<td>I</td>
</tr>
<tr>
<td>Sulfur</td>
<td>V/P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>V/P</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Urea</td>
<td>V/P</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Zinc (powder)</td>
<td>P</td>
<td>Y</td>
<td>I</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group C</th>
<th>P</th>
<th>N</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium perchlorate</td>
<td>P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Antimony trisulfide</td>
<td>P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Hexamine</td>
<td>P</td>
<td>Y</td>
<td>D</td>
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<tr>
<td>Magnalium (powder)</td>
<td>P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Magnesium (powder)</td>
<td>P</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Pentaerythritol</td>
<td>P</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Phenol</td>
<td>P</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Potassium nitrite</td>
<td>P</td>
<td>N</td>
<td>I</td>
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</table>
Implementation of Regulation 98/2013 by country. S: the country licenses or registers a subset of the precursor list.

- EU has implemented controls on general public’s possession and use of “restricted explosive precursors”
- Controls consist of restricting access for the general public (e.g. via licensing/permitting) at the member state’s discretion
  - 16 have adopted licensing/registries
  - 12 have continued to restrict access
- EU has actively engaged industry and other stakeholders to assist with implementation
  - Training materials and outreach
  - Regional meetings
  - Mystery shopping provides feedback
- EU reports improvements in security at some cost to industry and end users, along with concerns about coordination, coverage, and e-commerce
NAS Options for Retail-Level Control Strategies

• Consisting of different combinations of voluntary and regulatory programs, featuring either
  – Restricted access for personal use via licensing/permitting:
    – Licensing; and/or
    – Registry (ID and signature); or
    – Business as usual (BAU)
  + other measures and activities, such as outreach, training, reporting, etc.

• Exempting commercial end-users with evidence of commercial status, which might require new credential

Strategies might also include right to refuse sales under suspicious circumstances
NAS: Key Recommendations

• Combat both Small and Large IEDs
• Consider Multiple Chemicals
• Focus on Retail-Level Access
• Explore Opportunities to Harmonize Oversight of Kits for Making Explosive Targets
• Analyze Specific Provisions for Strategies
• Provide Additional Support for Voluntary Programs
Stakeholder Engagement

• **Engagement Stats**
  - 7 in-person meetings and 2 webinars
  - 100+ attended in-person
  - Invited trade associations and the sector councils involved in the sale of EPCs

• **Trends**
  - This is a very complex problem to address
  - Need to more fully engage retail industry
  - E-commerce is a critical gap
  - Need clarification on what EPCs would be covered
  - Lean toward a light regulatory approach (i.e., Sudafed)
  - Agree that a strong voluntary component to the framework is essential
  - Extensive outreach and training would be essential
  - Recognition and reporting of suspicious transactions is key
  - Leverage existing industry stewardship programs