USSOCOM
Chemical, Biological, Radiological & Nuclear Conference & Exhibition
Responding to the Terrorist CBRN Threat: “Preparation or Panic”
December 6-8, 2005

Chemical Homeland Security System
C-HoSS
CCS Capabilities

ISO 14001 EMS

CCS CENTRALIZED DATABASE
- Commercial Products
- Munitions – MIDAS
- Chemicals
- Chemical Agents
- Agent Simulants
- Security Factors
- Radioisotopes
- Bioterrorism Agents
- Regulations

Web-based ISO 14001 System reduces implementation time and cost by 300-400 manhours

ISO 14001 draws regulatory data (Air, Water, etc.) to expedite compliance, highlight conformance and reduce wastestreams

CENTRALIZED CHEMICAL HAZARD and ENVIRONMENTAL MANAGEMENT SUITE [C-CHEMS]

BIOLOGICAL HOMELAND SECURITY SYSTEM [B-HoSS]

RADIOLOGICAL HOMELAND SECURITY SYSTEM [R-HoSS]

CHEMICAL HOMELAND SECURITY SYSTEM [C-HoSS]

Secure Web Access Options
GIS Data Sources

MUNITIONS ANALYTICAL COMPLIANCE SUITE [MACS]

Sensor Data Input

Wireless Communication Options
Centralized Chemical Hazard and Environmental Management Suite (C-CHEMS)
Centralized and Relational Databases

- **Industrial Hygiene (IH-CAS)**
  - Locations & Types
  - Processes, Test Results

- **Centralized and Relational Databases**
  - **Chemical Tracking (C-CAS)**
    - or Existing System
    - Chemicals/Products
    - MSDS Images/Index, Location
  - **Chemical Safety (CS-CAS)**
    - Hazards, Incompatibilities, Storage

- **Natural Resources**
  - INRM Plan, NEPA, AR-200-3

- **Air (A-CAS)**
  - Permits, Processes, Test Results

- **Green Products (GP-CAS)**
  - Health Impact, Green Rating
  - Site-Specific

- **Water (W-CAS)**
  - Permits, Treatments
  - Test Results

- **Toxics (T-CAS)**
  - Locations & Types
  - Inspections, Test Results

- **Pesticides (P-CAS)**
  - Permits, Schedules, Inspections

- **Sensor Data Input**

- **Cultural Resources**
  - Inventory, NEPA, Mitigation Plans

- **Munitions (MACS)**
  - MIDAS Characterization
  - Constraints, Dispositions

- **Green Munitions (GM-CAS)**
  - Health Impact, Green Rating
  - Site-Specific

- **Cultural Resources**
  - Storage Tanks (ST-CAS)
    - Types & History, Permits
    - Inspection Criteria

- **Chemicals**

- **Chemical Agents**

- **Agent Simulants**

- **Regulations**

- **Biobased Ratings**

- **Biobased Products (BBP-CAS)**

- **Restoration Program**
  - Soil GIS, NJAC 7:14, CERCLA

- **Solid Waste (SW-CAS)**
  - Locations & Types
  - Schedules, Dispositions

- **Solid Waste (SW-CAS)**
  - GIS Data Sources

- **Hazardous Waste (HW-CAS)**
  - Locations & Permits
  - Schedules, Dispositions

- **Soil GIS, NJAC 7:14, CERCLA**

- **Secure Web Access Options**

- **Wireless Communication Options**

- **Sensor Data Input**
USSOCOM
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Scenario #4

**Sleeper Cell Agents Employed As**
- Chemical research laboratory technician—Columbia University, NYC
- Large high school custodian—downtown LA
- Supply clerk—Aberdeen Proving Ground, north of Baltimore
- Warehouse manager—large chemical manufacturer, near Chicago

**Their Objectives**
- Identify internal supply of readily accessible, incompatible chemicals
- Create a massive explosion
- Release substantial quantities of toxic air pollutants (CBR)

**Simultaneous Explosions**
- Same day—in/near 4 major U.S. cities
- Major local panic ➔ national fear
- Substantial loss of life—each site
- Serious long-term health & environmental effects
- Tremendous loss of confidence in homeland security

**Perpetrators Continue Their Employment**
- 1–3 years, then resign
- Seek new employment
- Next targeted institution & city
Chemical Homeland Security System (C-HoSS)

Centralized and Relational Databases

- **Industrial Hygiene (IH-CAS)**
  - Locations & Types
  - Processes
  - Test Results

- **Air (A-CAS)**
  - Permits
  - Processes
  - Test Results

- **Water (W-CAS)**
  - Permits
  - Treatments
  - Test Results

- **Toxics (T-CAS)**
  - Locations & Types
  - Inspections
  - Test Results

- **Pesticides (P-CAS)**
  - Permits
  - Schedules
  - Inspections

- **Chemical Tracking (C-CAS)**
  - Chemicals/Products
  - MSDS Images/Index
  - Location

- **Chemical Safety (CS-CAS)**
  - Hazards
  - Incompatibilities
  - Storage

- **Munitions (M-CAS)**
  - MIDAS Characterization
  - Constraints
  - Dispositions

- **Storage Tanks (ST-CAS)**
  - Types & History
  - Permits
  - Inspection Criteria

- **Hazardous Waste (HW-CAS)**
  - Locations & Permits
  - Schedules
  - Dispositions

- **Solid Waste (SW-CAS)**
  - Locations & Types
  - Schedules
  - Dispositions

- **Product Security & Containment (PS-CAS)**
  - Chemical Risks
  - Product Storage Codes
  - Security Standards

- **GIS Data Sources**

- **Secure Web Access Options**

- **Wireless Communication Options**

- **Sensor Data Input**
The CCS Relational Chemical and Product Database (R-CPD)

CCS CENTRALIZED DATABASE

- Commercial Products
- Munitions – MIDAS
- Chemicals
- Chemical Agents
- Agent Simulants
- Security Factors
- Radioisotopes
- Bioterrorism Agents
- Regulations

Product Descriptions
Product Components
MSDS Images
MSDS Index
Generic Categories
Manufacturers
User Director Processes
Green Ratings
Corrosive Ratings
Biobased Ratings

Cross-Reference Dictionary
Chemical Compound Dictionary
Toxicology Data
Holistic Hazard Ratings
Personal Protective Equipment
SAF-T-LABEL®
Safe Storage Codes
Safe Disposal Codes
Alloy Constituents
Emergency Response
Elemental Composition
Incompatibilities

20+ Agents
Disease Descriptors
Pathogenesis
Prophylaxis
Emergency Response
Decontamination
Treatment

475 Total Regulations
- Local
- State
- Federal
- International
- Non-government
- Corporate or Trade Association

Munitions Characterization—MIDAS
- Demil Processes
- Constituent Chemicals
- Chemicals Released
- Green Criteria
- Insensitive Criteria
- Corrosive Criteria
- Reliability Factors
- Hazardous Waste Forms
- Regulations

Properties
- Toxicology Data
- Hazard Issues
- Incompatibilities
- Storage
- Recommendations
- TICS/TIMs

Chemical Security Risk List
- Precursor Chemical Security Risk List
- Theft & Population Risks
- Accessibility Factors

Generic Families
- Properties
- Effects & Actions
- Storage & Security
- Diagnosis & Treatment
- Decontamination
- Emergency Response

The CCS Relational Chemical and Product Database (R-CPD) is a comprehensive database that includes detailed information on commercial products, munitions, chemicals, chemical agents, agent simulants, security factors, radioisotopes, and bioterrorism agents. It also covers regulations, properties, toxicology data, hazard issues, incompatibilities, storage recommendations, and other related data. The database is designed to provide a holistic view of chemical and product-related information, making it a valuable resource for various stakeholders in the chemical industry.
Enhanced MIDAS Database Library

Diagrams
Drawings
Specifications
Standards

Munitions [7442] → RRD Inventory [Stockpile]

MCN Library

Components [23,673] ← Parts [82,685]

Parts Environmental Disposition

Bulk Item Materials [4821]

MilSpec Review

Bulk Compounds [809]

PEP Materials [2096] → Inert Materials [7431]

Alloy Metal Content

PEP Compounds [876]

Nonmetal Chemical Content

Inert Compounds [292]

Compound Elements [52]

Regulatory Database

CAS # and Synonyms Dictionary
Regulated Hazardous Chemicals
Acute Hazard Orientation

Chemical Agents
- Neurotoxins
- Extreme Toxins
- Radioactives
- Explosives
- Shock Sensitives
- Corrosives
- Flammable Oxidizers
- Hazardous Air Pollutants
- Persistent Bioaccumulative Toxins
- Priority Pollutants

Chemical Security Risks List

ACGIH
DEA
DOT
EPA
OSHA
California
Iowa
Maryland
Nevada
New Jersey
European Community
Precursor Chemical Security Risks List

- CPSC Specialty Regulated Substances
- Canada Export Control Lists
- DEA Essential Chemicals
- DEA Precursor Chemicals
- DOC Export Restrictions
- EU Black/Gray Lists
- IATA Air Transport Forbidden
- IATA Passenger Transport Forbidden
- IATA Regulated Substances
- UK The Red List (Water)
- UN/FAO Prior Informed Consent
Chemical Agents and Simulants

Properties
- Structure
- Chemical
- Physical

Toxicology Data
- Human
- Animal
- In Vitro

Hazards
- Protection
- Decontamination
- Persistence
- Use

Incompatibilities
- Chemical
- Conditions
- Containers

Storage Recommendations
- Container
- Conditions
- Distances
- HSAS\textsuperscript{a} Variables

\textsuperscript{a} HSAS = Homeland Security Advisory System
## Toxic Industrial Chemicals/Toxic Industrial Materials (TICs/TIMs)

### Selected Examples

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Feedstocks:</td>
<td>Acrylamide, Chlorine, Hydrogen Chloride, Phosgene</td>
</tr>
<tr>
<td>Carbamate Insecticides:</td>
<td>Baygon, Mobam, Temik, Zectran</td>
</tr>
<tr>
<td>Organochlorine Insecticides:</td>
<td>Aldrin, Dieldrin, Endrin, Lindane, Heptachlor</td>
</tr>
<tr>
<td>Organophosphate Insecticides:</td>
<td>Disulfotan, Mevnphos, Parathion, Methylparathion</td>
</tr>
<tr>
<td>Insecticide Synergists:</td>
<td>Piperonyl Butoxide</td>
</tr>
<tr>
<td>Fungicides:</td>
<td>Pentachlorophenol, Hexachlorobenzene, Maneb, Naban, Zineb</td>
</tr>
<tr>
<td>Fumigants:</td>
<td>Calcium Cyanide, Methyl Bromide, Phosphine</td>
</tr>
<tr>
<td>Seed Disinfectants:</td>
<td>Methylmercury Acetate, Methylmercury Cyanide</td>
</tr>
</tbody>
</table>

### GOALS:

1. Identify all chemicals with severe to extreme acute toxicity
2. Identify all chemicals in product classes with similar mechanisms of action
# Incompatible Chemical Database

*(Published Book)*

<table>
<thead>
<tr>
<th>Chemical Class</th>
<th>Chemical</th>
<th>Incompatible Chemical</th>
<th>I.C. Class</th>
<th>Interaction Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corrosives</strong></td>
<td>Acetic Acid</td>
<td>Hydrogen Peroxide</td>
<td>Oxidizer</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Nitric Acid</td>
<td>Acetylene</td>
<td></td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Chlorine</td>
<td>Aluminum Powder</td>
<td>Metal</td>
<td>Spontaneous Fire</td>
</tr>
<tr>
<td><strong>Flammables</strong></td>
<td>Acetone</td>
<td>Chloroform</td>
<td>Carcinogen</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td>Chlorine</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Carbon Disulfide</td>
<td>Potassium</td>
<td>Flammable</td>
<td>Violent Explosion</td>
</tr>
<tr>
<td><strong>Reactives</strong></td>
<td>Nitrotoluene</td>
<td>Sulfuric Acid</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Nitroethane</td>
<td>Hydrocarbons</td>
<td>Combustible</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Acrylonitrile</td>
<td>Bromine</td>
<td>Corrosive</td>
<td>Explosion</td>
</tr>
<tr>
<td><strong>Products</strong></td>
<td>Toilet Bowl Cleaner</td>
<td>Metal Powders</td>
<td>Metals</td>
<td>Explosion</td>
</tr>
<tr>
<td></td>
<td>Bleach</td>
<td>Ammonia</td>
<td>Product</td>
<td>Poisonous Gas</td>
</tr>
<tr>
<td></td>
<td>Paint Solvent</td>
<td>Chloroform</td>
<td>Carcinogen</td>
<td>Explosive</td>
</tr>
</tbody>
</table>
## Safe Chemical Storage Codes
*(Published Book)*

<table>
<thead>
<tr>
<th>Code #</th>
<th>Chemical</th>
<th>Code #</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK26</td>
<td>Acetaldehyde</td>
<td>RD26</td>
<td>n-Hexane</td>
</tr>
<tr>
<td>PR29</td>
<td>Acetylene</td>
<td>YL10</td>
<td>Hydrogen chloride</td>
</tr>
<tr>
<td>PR01</td>
<td>Ammonia</td>
<td>YL07</td>
<td>Iodine</td>
</tr>
<tr>
<td>LG22</td>
<td>Aniline</td>
<td>RD23</td>
<td>Isopropyl alcohol</td>
</tr>
<tr>
<td>LG06</td>
<td>Arsenic</td>
<td>GN04</td>
<td>Lead</td>
</tr>
<tr>
<td>RD26</td>
<td>Benzene</td>
<td>LG24</td>
<td>Malathion</td>
</tr>
<tr>
<td>PK26</td>
<td>Benzine</td>
<td>LG07</td>
<td>Mercuric chloride</td>
</tr>
<tr>
<td>YL07</td>
<td>Bromine</td>
<td>YL27</td>
<td>Methyl chloroform</td>
</tr>
<tr>
<td>LG04</td>
<td>Cadmium</td>
<td>RD26</td>
<td>Methyl methacrylate</td>
</tr>
<tr>
<td>RD27</td>
<td>Camphor</td>
<td>RD26</td>
<td>Naphthalene</td>
</tr>
<tr>
<td>RD09</td>
<td>Carbon disulfide</td>
<td>YL12</td>
<td>Nitric acid</td>
</tr>
<tr>
<td>LG27</td>
<td>Chordane</td>
<td>WH23</td>
<td>Phenol</td>
</tr>
<tr>
<td>YL11</td>
<td>Chromic acid</td>
<td>RD06</td>
<td>Phosphorous (yellow)</td>
</tr>
<tr>
<td>LG23</td>
<td>Coal tar creosote</td>
<td>LG03</td>
<td>Potassium arsenate</td>
</tr>
<tr>
<td>GN26</td>
<td>Cottonseed oil</td>
<td>GN02</td>
<td>Potassium permanganate</td>
</tr>
<tr>
<td>GN01</td>
<td>Cupric nitrate</td>
<td>GN08</td>
<td>Soda lime</td>
</tr>
<tr>
<td>RD26</td>
<td>Cyclohexane</td>
<td>LG02</td>
<td>Sodium dichromate</td>
</tr>
<tr>
<td>RD27</td>
<td>1,2-Dichlorobenzene</td>
<td>RD26</td>
<td>Styrene monomer</td>
</tr>
<tr>
<td>GN22</td>
<td>Dimethylformamide</td>
<td>YL11</td>
<td>Sulfuric acid</td>
</tr>
<tr>
<td>PK21</td>
<td>2,6-Dinitrotoluene</td>
<td>RD26</td>
<td>Toluene</td>
</tr>
<tr>
<td>RD23</td>
<td>Ethyl alcohol</td>
<td>RD26</td>
<td>Turpentine</td>
</tr>
<tr>
<td>WH20</td>
<td>Formic acid</td>
<td>RD26</td>
<td>Xylenes</td>
</tr>
</tbody>
</table>
### Chemical Security Procedures

#### Security Procedure Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
</table>
| Phase I | Vulnerability Assessment  
*Identify chemical hazards, security risks, mortality risks* |
| Phase II| Countermeasures Implementation  
*Reduce vulnerabilities* |
| Phase III| Verification Audit  
*Independently confirm counter measure adequacy* |
| Phase IV| Management System Integration  
*Integrate chemical security procedures into line management functions* |
C-HoSS Security Criteria and Standards

- Chemical Hazard Class Rankings *(by Hazard Class)*
- Chemical Hazard Grades (1-4) *(within each ranking)*
- Product Concentration Grades (1-4)

\[
\text{Chemical Hazard Factor (CHF)} = \text{Ranking} \times \text{Grade} \times \text{Concentration}
\]

- Theft Risk Grades (1-4) *(per product)*

\[
\text{Chemical Security Risk Factor (CSRF)} = \text{Ranking} \times \text{Grade} \times \text{Concentration} \times \text{Theft Risk}
\]

- Population at Risk Grades (1-4)

\[
\text{Chemical Mortality Risk Factor (CMRF)} = \text{Ranking} \times \text{Grade} \times \text{Concentration} \times \text{Theft Risk} \times \text{Population Risk}
\]

- Accessibility Factor Levels *(Storage Constraint Levels and Descriptors)* (0.5 - 4.5)

\[
\text{CMRF} \times \text{Accessibility Factor (AF)} = \text{Vulnerability Factor (VF)}
\]
Chemical Security Product Storage Codes

<table>
<thead>
<tr>
<th>Based Upon CSRF</th>
<th>Codes = AF Levels a</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSRF = 600, or CHF = 38 b</td>
<td>= AF Level 1</td>
</tr>
<tr>
<td>CSRF = 1200, or CHF = 75</td>
<td>= AF Level 2</td>
</tr>
<tr>
<td>CSRF = 1800, or CHF = 100</td>
<td>= AF Level 3</td>
</tr>
<tr>
<td>CSRF = 2400, or CHF = 150</td>
<td>= AF Level 4</td>
</tr>
</tbody>
</table>

a AF Levels will be calculated at 1/2 step intervals.
b Whichever is lower for a hazardous material.
Chemical Security Criteria and Homeland Security Advisory System (HSAS) Correlation

If CSRF = or CHF =

Then AF Increases

2 Levels

1.5 Levels

1.0 Levels

0.5 Levels

0 Levels

HOMELAND SECURITY ADVISORY SYSTEM (HSAS)

SEVERE | HIGH | ELEVATED | GUARDED | LOW
-------|------|---------|---------|------
Red    | Orange | Yellow | Blue | Green
> 400  | > 800  | > 1600 | > 2400 | > 2800
or 50  | or 80  | or 110 | or 130 | or 160
> 80

1.5 Levels

1.0 Levels

0.5 Levels

0 Levels

1.0 Levels
C-HoSS Security Risk Assessment Analytical Reports

**PRODUCT & CHEMICAL ANALYSES**
- Inventory by Product Type
- Product by Location
- Product by Container Size
- Product by Weight
- Product Hazard Classifications
- Product Hazard Rankings
- Product Hazard Grades
- Product Hazard Factors
- Product Security Risk Factors
- Product Accessibility Factors
- Product Accessibility Levels/Storage Codes
- Chemicals by Product
- Pure Chemicals by Location
- Pure Chemicals by Weight

**PRECURSOR CHEMICAL ANALYSES**
- Precursor Chemicals by Location
- Precursor Chemicals by Container Size
- Precursor Chemicals by Weight
- Precursor Chemicals Hazard Classifications
- Precursor Chemicals Hazard Rankings
- Precursor Chemicals Hazard Grades
- Precursor Chemicals Hazard Factors
- Precursor Chemicals Security Risk Factors
- Precursor Chemicals Accessibility Factors
- Precursor Chemicals Accessibility Levels/Storage Codes

**SPECIALTY MODULE ANALYSES**
- Air Releases
- Water Contaminants
- Toxics
- Pesticides
- Hazardous Waste
- Solid Waste
- Storage Tanks
- Munitions
- Chemical Safety
- Industrial Hygiene

**INCOMPATIBILITY ANALYSES**
- Prioritized Incompatibility Threats by Product
- Prioritized Incompatibility Threats by Room
- Prioritized Incompatibility Threats by Building
- Prioritized Incompatibility Threats by Facility

**SECURITY ANALYSES**
- Inventory by CHF
- Inventory by CSRF
- Inventory by AF
- Inventory by Storage Levels
- Inventory (shift) by HSAS

---

*a Chemical, Precursor Chemical, Munition, Chemical Agent, Simulant.
b Assigned by their worst classification: (1) innate classification, or (2) reaction product classification.
## C-HoSS Capabilities vs. Chemical Security Procedures

<table>
<thead>
<tr>
<th>Security Procedure Phases</th>
<th>C-HoSS Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHASE I</strong></td>
<td><strong>Chemical Hazard Factor Report</strong></td>
</tr>
<tr>
<td>Vulnerability Assessment</td>
<td>Chemical Security Risk Factor Report</td>
</tr>
<tr>
<td><em>Identify chemical hazards, security risks, mortality risks</em></td>
<td>Chemical Mortality Risk Factor Report</td>
</tr>
<tr>
<td></td>
<td>Chemical Vulnerability Risk Factor Report</td>
</tr>
<tr>
<td><strong>PHASE II</strong></td>
<td>Accessibility Factor (Storage Constraint) Report</td>
</tr>
<tr>
<td>Counter Measures Implementation</td>
<td>(per chemical/material)</td>
</tr>
<tr>
<td><em>Reduce vulnerabilities</em></td>
<td><strong>PHASE III</strong></td>
</tr>
<tr>
<td><strong>PHASE III</strong></td>
<td>Chemical Vulnerability Factor “Report Card”</td>
</tr>
<tr>
<td>Verification Audit</td>
<td><em>(to the local fire department)</em></td>
</tr>
<tr>
<td><em>Independently confirm counter measure adequacy</em></td>
<td><strong>PHASE IV</strong></td>
</tr>
<tr>
<td><strong>PHASE IV</strong></td>
<td>Integration of C-HoSS w/ chemical tracking system</td>
</tr>
<tr>
<td>Management System Integration</td>
<td>Daily C-HoSS correlation w/ Homeland Security</td>
</tr>
<tr>
<td><em>Integrate chemical security procedures into line management functions</em></td>
<td>Advisory System</td>
</tr>
</tbody>
</table>
For information, contact:

Dr. George Thompson
georgethompson@chemply.com
973-663-2148