DTRA Technical Reachback

Overview

Research and Development Directorate (J9)
Information Sciences and Application Department
Technical Reachback Division

Distribution Statement A: Approved for public release; distribution is unlimited.
Mission

Provide 24/7 Chemical Biological Radiological Nuclear Explosives (CBRNE) Subject Matter Expertise Advise and Decision Support Capability for planning, operations, and post event analysis to:

Unified Combatant Commands (COCOMs), Office of the Secretary of Defense (OSD) Joint Staff (JS), Intelligence Community (IC) command elements, and other US Government and first responders
24/7, 365 response to WMD and CBRNE Requests

- Real-world HAZMAT Events – First Responder Support
- Counter – WMD Targeting
- Collateral Damage Effects Mitigation
- Contingency Operations
- Planning, Training and Subject Matter Expertise

Numerous Decision Support tools/software

Deployment Teams: Technical Support Teams (TST)

Residential & Mobile Training

Assistance, Advice and Analysis
Our Customers and Partners

Joint Staff and the Unified Combatant Commands

NATO and Allies

Military Services

DoD and Other Federal Agencies

and many others...
Led by FEMA/Department of Homeland Security, the IMAAC is a partnership among 7 Federal agencies, each with supporting capabilities and/or responsibilities for atmospheric modeling support for:

**Real World Events – Exercise – Training**
- Department of Homeland Security
- Department of Defense
  - Defense Threat Reduction Agency
- Department of Energy
  - National Atmospheric Release Advisory Center
- Department of Health and Human Services
- Environmental Protection Agency
- National Oceanic and Atmospheric Administration
- Nuclear Regulatory Commission

For More Information Go To: http://www.dhs.gov/imaac
## Exercises/Operations Supported

### Real World Events

<table>
<thead>
<tr>
<th>DHS / National Security Significant Events (NSSE)</th>
<th>Presidential Inaugurations, Republican/Democratic Party Conventions, Olympics, Super Bowls, and ~24 IMAACs per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTHCOM / NGB Civil Support Teams</td>
<td>Hurricane Support, Deep Water Horizon, Real-World incidents like San Diego bomb factory house burn and Elk River Spill in WV.</td>
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<tr>
<td>STRATCOM</td>
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<tr>
<td>CENTCOM</td>
<td>Syria, Operation Enduring Freedom, Operation Iraqi Freedom</td>
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<tr>
<td>PACOM</td>
<td>Fukushima Daiichi operational support</td>
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<tr>
<td>EUCOM / AFRICOM</td>
<td>Olympics, 2014 Ebola outbreak, Odyssey Dawn</td>
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<tr>
<td>SOUTHCOM</td>
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</tbody>
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### Exercise & Training Events

<table>
<thead>
<tr>
<th>DHS / National Security Significant Events (NSSE)</th>
<th>National Level Exercises (NLEs), TOPOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTHCOM / NGB Civil Support Teams</td>
<td>Ardent Sentry, Vigilant Shield, Patriot Guard, Numerous Training Exercises</td>
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<tr>
<td>STRATCOM</td>
<td>Global Thunder, Global Lightning, IMAT</td>
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<tr>
<td>CENTCOM</td>
<td></td>
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<tr>
<td>PACOM</td>
<td>Terminal Fury, Cobra Gold, Ulchi Freedom Guardian, Key Resolve</td>
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<tr>
<td>EUCOM / AFRICOM</td>
<td>Guardian Shield, Steadfast Nerve, Austere Challenge</td>
</tr>
<tr>
<td>SOUTHCOM</td>
<td>Able Warrior</td>
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</table>
FY 2014 Requests for Information

2011 totals include over 400 RFIs associated with contingency operations in PACOM & CENTCOM

2014 Total RFIs: 2,080
IMAAC Activations: 24
DTRA Modeling Tools

- Atmospheric Plume Modeling (HPAC)
- Waterborne Hazard Modeling (ICWater & SHARC)
- Counter IED Attack Modeling (VAPO)

- Hard Target Defeat Modeling (IMEA)
- Pandemic Modeling (CNIMS)
- Earthquake, Wind, and Flood Damage Modeling (HAZUS)
DTRA Reachback and GIS

- Serves as a tool to present the modeling results to decision-makers through high-resolution imagery and street maps with critical infrastructure locations/POIs (HPAC, SHARC, HEMP results)

- Serves as platform for some of our modeling tools (e.g. ICWater, HAZUS, NucFast)

- A source of geo-referenced imagery for modeling tools that do not have standalone mapping capabilities (VAPO, IMEA)
Forward deployable, probabilistic CBRN hazard prediction model that assists the responders in analyzing WMD employment.

**Model Types:**
- CB Weapon or Facility
- Radiological Weapon
- Industrial Facility
- Industrial Transportation
- Nuclear Weapon or Facility Incidents
- Missile Interception

**Weather Options:**
- Historical
- Current Observations
- NWP Forecast
- User-defined
- Climatology

**Outputs:**
- Human Medical Effects
- Contaminated Areas
- Hazard Areas
- Casualties
This model does not account for any burning of products from the house fire.

FACTS
Escondido, CA
Location: 33.152371° N / 117.105315° W
Strike Time: 1900Z 09Dec2010
Type: Sulfur Trioxide
Amount: 2.31 kg
Release: 20 minutes duration
Weather: 12 km NAM
Model: HPAC 5.0 SP1
Static Population Estimates:
LandScan 2009
Example: Bomb Factory House
News Coverage 09 Dec 2010
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Example: Deliberate Targeting
(Batch Run – HPAC)

(1) Low – 10APR2013

(2) High – 11APR2013

Case Date Casualties
High 11APR2013 0000Z ~100,000
Low 10APR2013 1200Z ~200

50% Mortality
50% Casualty
10% Casualty
Total Activity Isotope Air Concentration represents standard detectable levels of radioactivity from all possible radioactive isotopes released by the reactor at that exact time.

Note: Percent release decreased based on data on 0300Z 08APR2011

These are simulated data and are NOT to be used for dose calculations

Models are for air dispersion only and do not account for water dispersion.

Note: These concentrations are very low and not exceptionally dangerous to human health, but monitoring devices may see hits.
Example: Calbuco Volcano Eruption in Chile
(HPAC) – Situation Awareness
Dispersion and activity modeled by a continuous release of a distributed source (constant magnitude) at 0-20m in depth.

Source magnitude based on MEXT and TEPCO monitoring data.

Actual total activity may be greater than predicted due to presence of other radionuclides not shown.

Other constituents will disperse similarly and preliminary simulations suggest that total contamination will not exceed the overall footprint presented above.

**This model does not estimate effects on marine life**
ICWater is a program that allows for downstream dispersal and subsequent hazard modeling, here with Methanol after the 2014 Elk River chemical spill in Charleston, WV.

Stream and river flows used in ICWater are derived from web accessible real-time gauging stations maintained throughout the country by USGS.

Distance from incident location to Cincinnati: 265 km
Example: Infectious Disease Spread

Comprehensive National Incident Management System (CNIMS)

- Developed for DTRA by Virginia Tech (VT) – Virginia Bioinformatics Institute (VBI)
- CNIMS models the spread of infectious disease by simulating movement, proximity, and interactions between individuals within a geographic region using high-performance computing (HPC)
- CNIMS has been used for real world events (2009 H1N1 & 2014 Ebola), exercises (SLE ’13), and planning requests (Alabama National Guard, NORTHCOM)
- Utilizes a web-based GUI that allows for user-specification of scenario parameters
Example: Ebola Outbreak in Liberia

Reachback produced briefs up to 3 times per week and distributed to partners in DoD including:

- up-to-date situation reports, maps, and technical information about Ebola Virus Disease

Reachback set up operations at the Virginia Tech Northern Virginia Research Center for enhanced collaboration and communication with the VT staff supporting Ebola modeling.

Sample Output of Location Allocation for LandScan-6 (2-way)

Sample Movie of output from MapOptimizer illustrating the process
Example: Modeling Nuclear Detonations
High Altitude ElectroMagnetic Pulse (HEMP)
Relatively fast-running, higher-fidelity model for nuclear weapon effects in urban environments

*Also referred to as the NSWET FRM prototype*
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Vulnerability Assessment and Protection Option (VAPO)

**Capabilities**

- 3-D modeling of a multiple building sites
- Suitable for unconventional weapons and explosives (IEDs, VBIEDs)
- Provides structural damage maps, pressure, impulse, and structural and human effects offsets
- Component based analysis using gage points
- Collapse models available for certain structures
- Handles orthogonal and non-orthogonal structures
- Models both interior and exterior structural and human effects

**Image Legend**

1- Human Injury Contours
2- Structural Contours
3- Peak Shock Pressure Map
4- Structural Damage Map

**FACTS**

Incident: Large VBIED
Model: VAPO 5.1.2
HAZUS-MH is a multi-hazard risk assessment and loss estimation software program developed by the Federal Emergency Management Agency (FEMA)

**HURRICANE • EARTHQUAKE • FLOOD**

- The tool can identify hazard related risks, calculate potential losses to life and property, and help define effective ways to reduce losses
- Useful for emergency management support, planning-level estimations and mitigation actions

7.1 Hayward Fault (northern California) Earthquake

Hurricane Effects over Florida
DTRA Reachback Contact Information

✓ DTRA Operations Center (24/7 Operations):
  • NIPR: DTRA-SCC-JOC@MAIL.MIL
  • SIPR: DTRA-SCC-JOC@MAIL.SMIL.MIL
  • JWICS: OPSCENTER@DTRA.IC.GOV
  • PHONE: 703-767-2003
  • DSN (STE): 427-2003

✓ DTRA Technical Reachback (24/7 Operations):
  • NIPR: REACHBACK@CNTTR.DTRA.MIL
  • SIPR: DTRA-REACHBACK@MAIL.SMIL.MIL
  • JWICS: REACHBACK@DTRA.IC.GOV
  • PHONE: 703-767-3445/3448
  • DSN (STE): 427-2138

✓ Training Support (Mobile or in Resident)
  • NIPR: REACHBACK@CNTTR.DTRA.MIL

✓ Software Distribution
  • NIPR: REACHBACK@CNTTR.DTRA.MIL