Next Generation Chem Bio Battle Management
Integrated Information Management System

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Conference & Exhibition
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Agenda

• Favorite slides from the project
  – How we got here

• OODA Loop
  – Data, information and knowledge flow in IIMS

• IIMS Capabilities and Battle Management Issues

• What still needs to be done
**Objective:** Develop a program leveraging existing, multi-mission sensors to support a NBC sensor fusion and battle management capability.

**Description of Effort:** Existing and proposed MASINT sensor systems will be examined and a means developed for tracking and fusing information from passive, active and human data sources used to detect and track chemical and biological attacks. Technologies from the Control of Agent-Based-Systems, Effects Based Operations and the Joint Warning and Reporting Network programs will be used to integrate sensor systems and command and control systems.

**Benefit to Warfighter:** Warfighting elements will be provided an immediate CB situational awareness, links to sensors, and a capability to disseminate fused information to appropriate decision makers for in-time response to detected threats.

**Challenges:**
- Representation of sensor data to support automated reasoning
- Handling uncertainty in sensor data in near-real time
- Control of heterogeneous sensors and decision-making systems

**Maturity of technology:** Advanced Technology Development (6.3)

**Business Area:** Information Systems Technology

**Major goals/milestones by FY:**
- FY04: Integration of sensors and reasoning framework
- FY05: Support for management of data uncertainty
- FY06: Delivery and test of initial capability (end-to-end)
- FY07: Delivery and test of enhanced capability (increased #'s of sensors, multiple decision-making threads)

**Funding ($K):**

<table>
<thead>
<tr>
<th></th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>Total</th>
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<tr>
<td></td>
<td>6.2</td>
<td>500</td>
<td>700</td>
<td>500</td>
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# Battle Management Spectrum

<table>
<thead>
<tr>
<th>Fixed Site</th>
<th>Expeditionary Site</th>
<th>Mobile Site</th>
<th>Incident Response</th>
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<tbody>
<tr>
<td>(RestOps)</td>
<td>(CASPOD)</td>
<td></td>
<td>(IMCR)</td>
</tr>
<tr>
<td>Fixed Participants</td>
<td>Know Participants</td>
<td>Know Participants</td>
<td>Unknown Participants</td>
</tr>
<tr>
<td>Fixed Infrastructure</td>
<td>Portable Infrastructure</td>
<td>Mobile Infrastructure</td>
<td>Any Infrastructure</td>
</tr>
<tr>
<td>Well Defined Mission</td>
<td>Defined Mission</td>
<td>Defined Mission</td>
<td>Save Lives</td>
</tr>
<tr>
<td>Train Together</td>
<td>Coordinated CONOPS</td>
<td>Coordinated CONOPS</td>
<td>Limited or No CONOPS</td>
</tr>
<tr>
<td>Years to prepare</td>
<td>Weeks to Prepare</td>
<td>Hours to Prepare</td>
<td>Hours to Prepare</td>
</tr>
<tr>
<td>Single Platform</td>
<td>Multiple Platforms</td>
<td>Multiple Platforms</td>
<td>Any Platform</td>
</tr>
</tbody>
</table>
The Path followed

2003 RestOps
2004 JWID
2004 Beaumont
2005 CWID
2005 Kuwait AS
2006 Kuwait KNB
2006 CWID
2006 JOEF
2007 IE-Ku??
2007 CWID

RestOps
CASPOD
NGCBBM
Shared COP
AF 46th TS
Chem/Bio Battle Management

Portal Shield
Detector Network

Remote Data Relay
Detector Network

Remote Data Relay
Warning Network

One-Way Link

Remote Client

Local SME Analysis

Local NBC Modeling

Survival Recovery Center

Rapid Manual Data Extraction

Rapid Manual Data Entry

Manual Data Entry

Remote NBC Modeling (JEM)

Remote C2 System

Remote SME Analysis (JWARN / JOEF)

Potential Comm Link
Transitioning Technology to the Warfighter

(Parallel Spiral Development)

• Create a Receptive host for Tech Transition
  – Provide a C2 Backbone for researchers to build against
  – Integrate mature IT products using ACTDs
  – Technically and Operationally Test concepts for Military Utility
  – Transition to either Core Programs or existing Battle Management Systems

• Field technology, solutions, and CONOPs
  – Build on success
  – Add components
  – Provide blue print for NBC Battle Management
  – Generalize the solution to address joint CONOPS
  – CONOPS and Technology leapfrog
Observe, Orient, Decide and Act Loop

Data, information and knowledge flow in IIMS
CBRN

Battle Management Questions

• What is it?

• Where is it?

• What is the impact on missions?

• How long will impact last?

• What will change the extent, degree or length of impact?

• What confirms/contradicts a change in impact?
Battle Space

Battlefield Situational Awareness

- Force Protection
- Met Data
- Hazard Models
- Attack Events
- Sensor Data
- Operational Status: LG, SF, TRANS, OPS, FD, EOD, ETC…
UNCLASSIFIED
Battle Management
Data, Information and Knowledge Flow

Resource Status per Mission

Response Plan Per Mission

Analysis and Assessment Per Mission

Structured Messages
USMTF CAP

Human Interaction
EAR

Electronic Sensor Networks
Warning Networks

Resources of Interest for a Mission

(Entities)
UNCLASSIFIED

Battle Management
Data, Information and Knowledge Flow

Consequence Management
JWARN Messaging
JOEF
SOP
CONOPS

Response Plan Per Mission

Resource Status per Mission

Analysis and Assessment Per Mission

Analytical Modeling
JWARN Correlation
ATP-45
ERG
JEM
JOEF
STAFFS
CHEMRAT
SAVIOR

Structured Messages
USMTF
CAP

Simulation

Human Interaction
EAR

Simulation

Electronic Sensor Networks
Warning Networks

Simulation

Resources of Interest for a Mission

(Entities)
IIMS Capabilities and Battle Management Issues
PATROL REPORT SUMMARY
Click on question number to modify answer.

A. Size & Composition of Patrol
1. How many personnel were in your patrol?
   45

2. How many vehicles?
   6

3. List the elements that composed your patrol and the number of persons in each
   Assault-10, Support-20, Security-16

B. Tasks (mission)
4. What type of patrol did you conduct?
   Combat

5. What type of combat patrol did you conduct?
   Security

C. Time of Departure
6. What was the departure time of the patrol?
   9-Sep-05 04:00
CBRN Detector Networks
<table>
<thead>
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<th>Type</th>
<th>Originator</th>
<th>Message Creation Time</th>
<th>Classification</th>
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<td>2012-02-15 00:00:00</td>
<td>Unclassified</td>
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</tr>
</tbody>
</table>
CBRN Warning Networks

Antenna →

Lights ←

Detector
Remote Data Relay

Solar Panel
Battery Box
M8 Detection

- Detections analyzed and believed to be real
  - SME evaluated the data points
Chem Region Drawn by SME

- SME determines region contaminated at level of detections
  - Manually tag data points to region and resources in it according to SME
Contaminated Region from Model

- Model predicts contamination levels based on detections and formalized SME
  - Automated tagging of data points to region and resources in it
CBRN Message Content Management

Evacuation Report Generator

- HEADER: Remove - Propagate
- ALFA: Remove - Propagate
- DELTA: Remove - Propagate
- FOXTROT: Remove - Propagate
- GOLF: Remove - Propagate
- INDIA: Remove - Propagate
- PAPAA: Remove - Propagate
- PAPAX: Remove - Propagate
- XRAYB: Remove - Propagate - Propagate Outer Contour
- WEATHER: Remove - Propagate

[OK] [Cancel]
CBRN Message Content Management

Full Message

Evacuation Message

UNCLASSIFIED

This Report was generated by the Evacuation Report Tool.
CBRN Message Content Management

Full Message

Evacuation Message
Status Summary and CON Toolbar
Sweep Manager and Progress Monitor
Heat Index Guidance
Implementation of the CBRN Data Model
CBRN Data Model

- Evaluated
  - CBRN Messages
  - Detector and Sensor Data
    - In process

- Database Normalization
  - CBRN Report is a hierarchy of groups broken down into fields
  - Table relationships in the data model do not mirror the relationships in the reporting standard
  - Each group in the message maps to multiple tables in the model
  - Each table in the model may handle data from more than one group
CBRN Data Model Recommendation

• It works
• No show stoppers, but too comprehensive for specialized uses

• Use the same data structure at multiple levels
  – Remote Data Relay comm node
  – Remote Data Relay Command Post
  – IIMS Database

• Build lightweight sub schemas for specialized uses
  – CBRN messages
  – Sensor and detector data
Battle Management Requirement for Effective use of Models

- Keep models one layer deep
- Replace predicted results with ground truth or known results at every level
It’s not done

• Improved data acquisition and distribution
  – Field observation data
  – Sensor / detector / warning networks
  – Other C2 systems

• Easier integration of analytical models and SME analysis
  – Impact region
  – Operational effects
  – Human effects
  – Confidence

• Easier insertion of response plan and real time response
  – Checklists, sweeps, BSD
  – EAR grouping and information tagging

• GUI to effectively and accurately convey knowledge to the warfighter

• Interoperable Information