



CHEMICAL BIOLOGICAL DEFENSE CONFERENCE

**Dr. RAYMOND A. MACKAY
DIRECTOR
RESEARCH AND TECHNOLOGY DIRECTORATE**

Report Documentation Page

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DoD Non-Med Tech Base Process

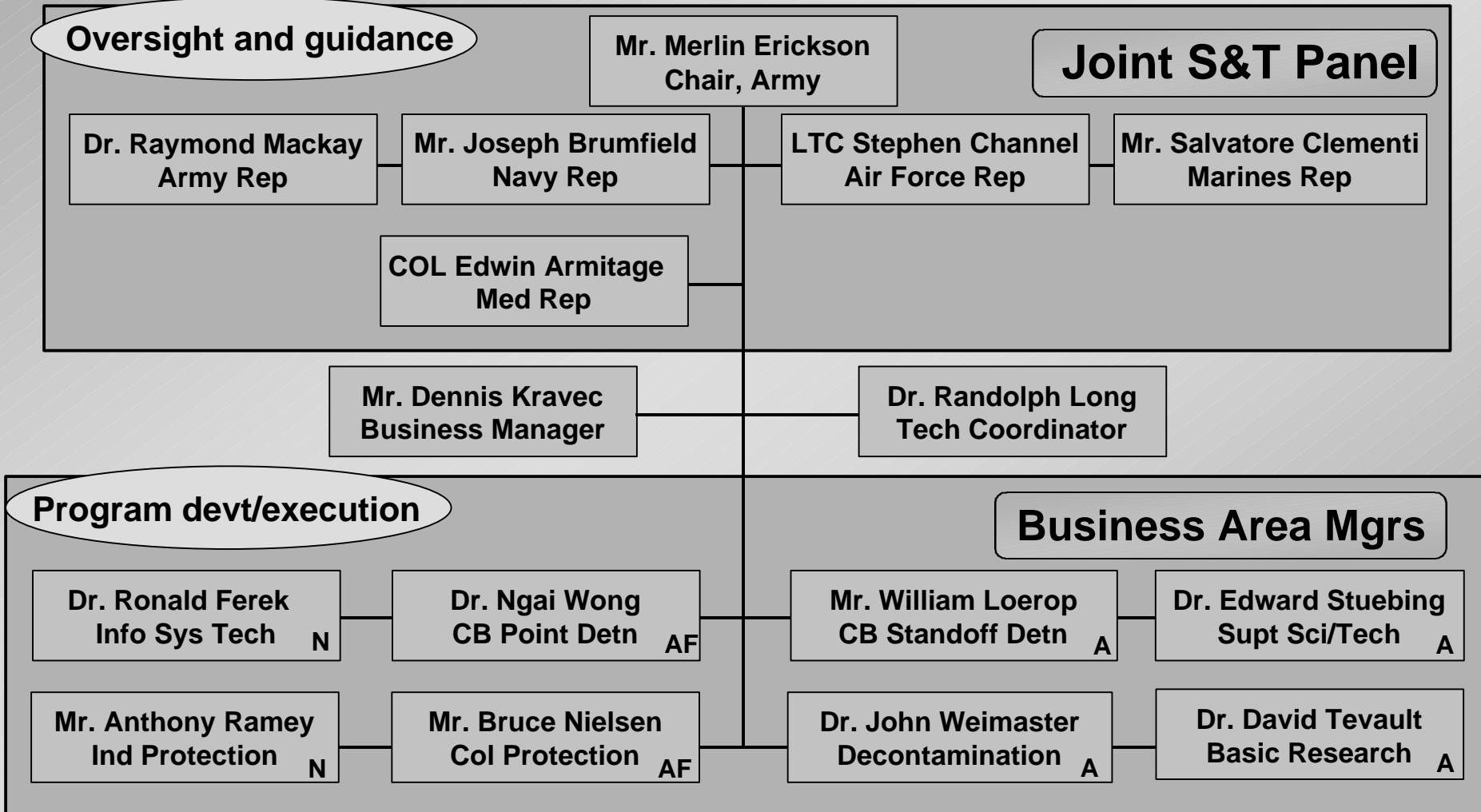
Joint Science and Technology Panel for Chemical / Biological Defense

- ◆ **Addresses all phases of research in five commodity areas (modeling/simulation, detection, individual protection, collective protection, decontamination)**
- ◆ **Executed by Principal Investigators within Service labs**
- ◆ **Utilizes proposal-driven process focused by user-developed desired operational capabilities**
- ◆ **Responsive to development/acquisition program**
- ◆ **Managed as fully Joint Services program**



Management Structure

Joint Science and Technology Panel for Chemical / Biological Defense





Joint Future Operational Capabilities Ranking: Driver for Investment

Joint Science and Technology Panel for Chemical / Biological Defense

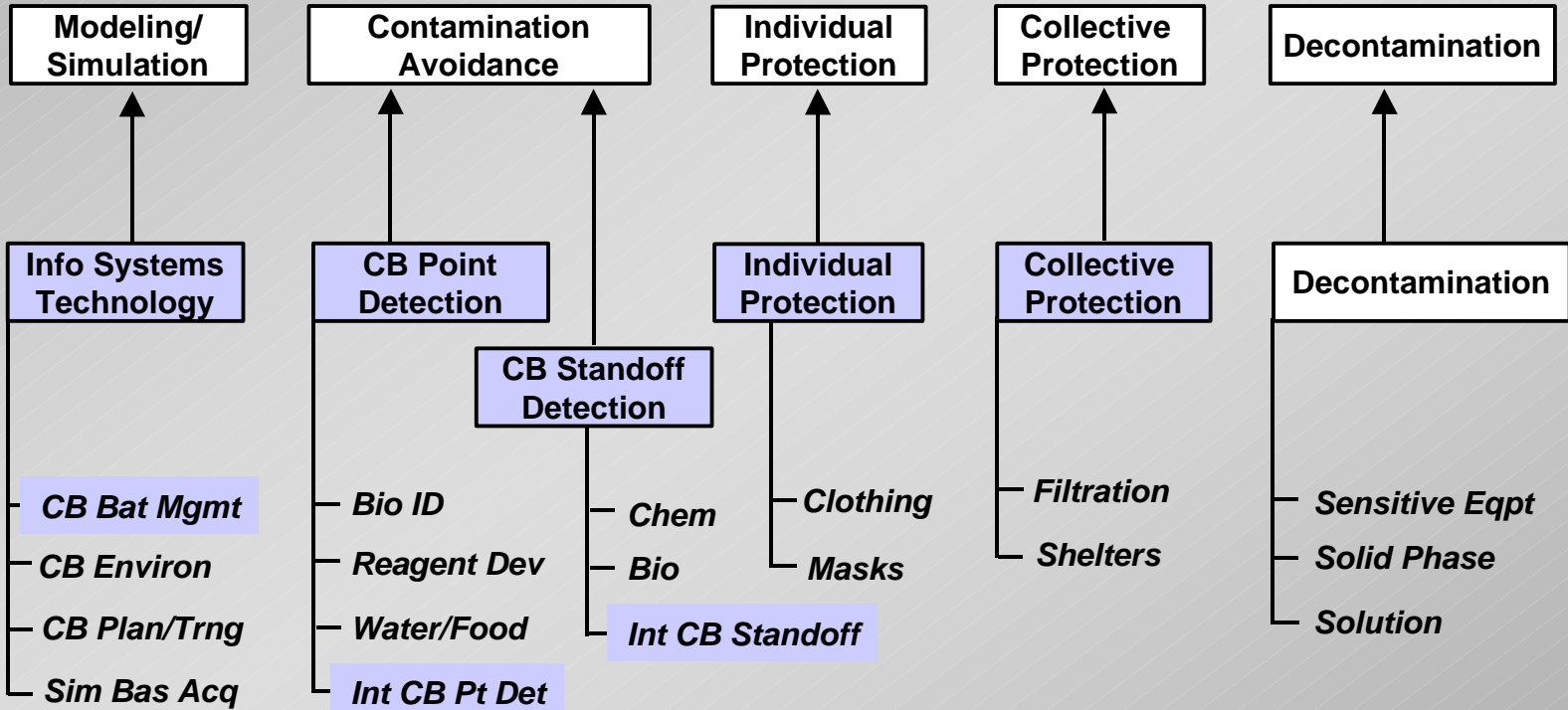
1 BatMgt - Battle Management Systems	11 ConAvoid – Sensor Integration
2 ConAvoid - Biological Early Warning	12 Restore – Medical Diagnosis
3 BatMgt - Battle Analysis	13 ColProt – Mobile Applications
4 ConAvoid – Chemical Early Warning	14 Restore – Medical Treatment
5 BatMgt – Modeling & Simulations Training	15 ConAvoid – Radiological Early Warning
6 IndProt – Medical Prophylaxes	16 Restore – Equipment/Facilities/Large
7 ConAvoid – Biological Point Detection	17 Restore - Logistics
8 IndProt – Respiration & Percutaneous	18 ColProt – Fixed Site Applications
9 ConAvoid – Med Surveillance/ Vet Support	19 ConAvoid – Radiological Point Detection
10 ConAvoid – Chemical Point Detection	20 Restore – Personnel/Patient Decon



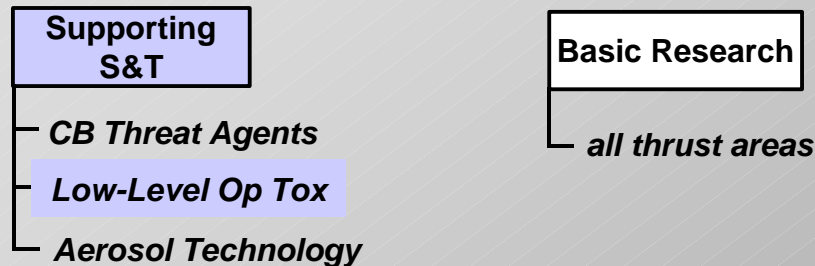
Non-Med CB Defense Program Taxonomy

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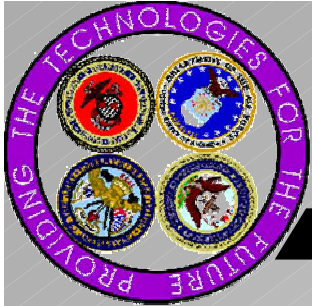
Commodity Areas



Foundation S&T Business Areas



Areas involved in change process for FY01



Near-Term Fielded vs Far Term Desired: An Example of the User's Challenge to S&T

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Joint Bio Point Detn System

- Fully Automated
- 12 Hour Continuous Operations
- 10 Agent ID within Minutes of Detection
- Sample Isolation
- < 30 Minute Set-up

Three years



Joint Chem Agent Detector

- Hand size
- Miosis level detn of blister, nerve, blood
- Records dose
- Networked, remotely controlled

Twelve years



Joint Modular CB Detector

- Hand size (40 cu in)
- Identifies chemical agents
- Detects bio agents
- Networked



Information Systems Technology Thrust Areas

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❖ New thrust area for FY01-02

❖ Sub-thrusts include

- Sensor integration
- Information management
- Data fusion
- Communications interfaces
- Visualization approaches

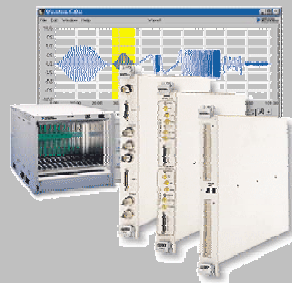
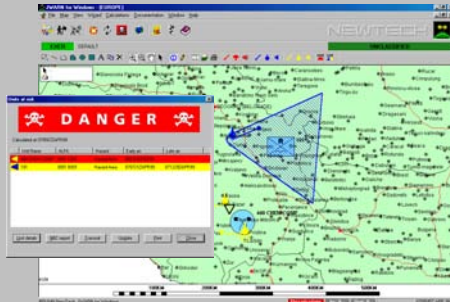
- Panel of experts meeting is planned to refine/develop program objectives

- Disparate sensors – non-CB sensors that can provide info on CB events

FY01 activities:

- 6.2: Survey, characterize available potential sensors, e.g., acoustic, seismic sensors, FLIRs

- 6.3: Conduct field evaluation of radar as standoff CB event cueing device as well as sensors identified in 6.2; joint with PM-NBC



Q36/Q37

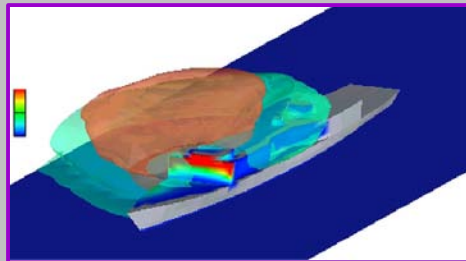
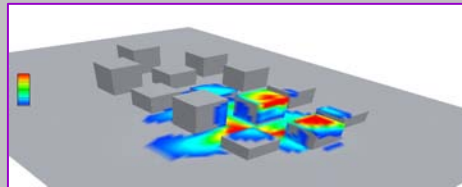


Information Systems Technology Thrust Areas

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CBW Environment

Objective: Models to track evolution of CB threats from vapor, liquid, and solid agents across range of scales from individual to theater



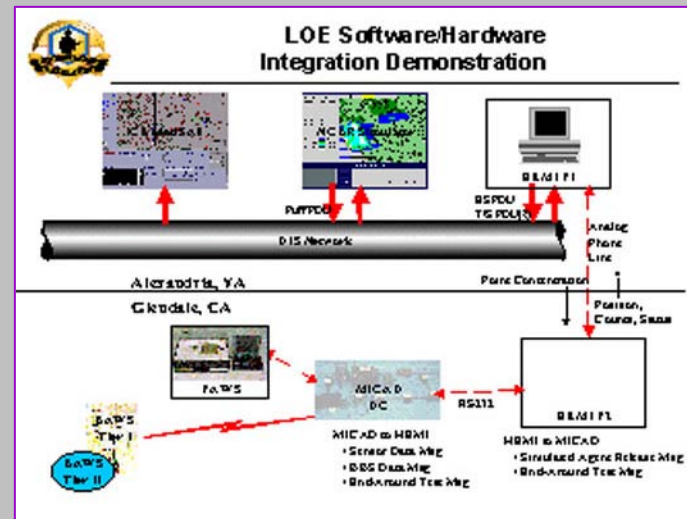
CBW-CFX Model

CB Planning/Analysis

Objectives: Models to describe effects of CBW on operations

Simulation Based Acquisition

Objective: Models supporting development of CBD equipment





CB Point Detection Thrust Areas

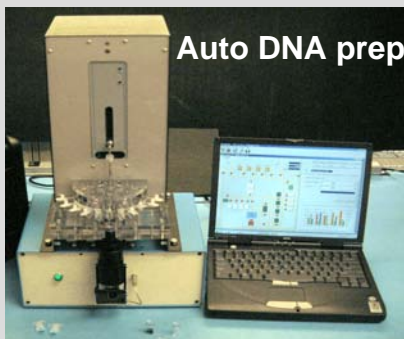
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Biological Identification

Objectives: Develop fully automated sample prep and analysis systems for unattended monitoring of air samples; transition FY02 to JBPDS

Challenges:

- fluidics
- biomarker extraction/cleanup
- background interference



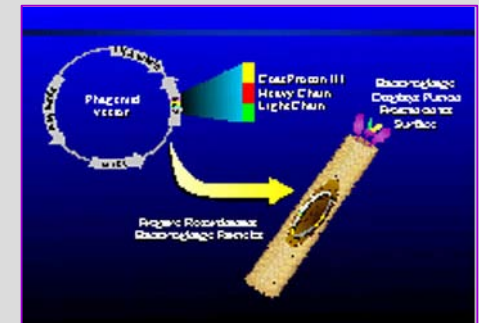
❖ *Demonstrated detection of mass and genetic markers at JPBDS requirement levels; built 2 cu ft breadboards*

Reagent Development

Objectives: Develop improved reagent candidates for implementation in fielded and developmental identifiers via Critical Reagent Program

Challenges:

- specificity
- shelf life
- reproducibility



❖ *Demonstrated improved sensitivity of recombinant antibodies vs available monoclonals; initiated assessment of combinatorial peptide*



CB Point Detection Thrust Areas

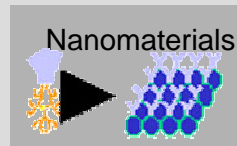
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Detection in Water/Food

Objectives: Provide the capability to detect, identify, and quantify chemical and biological contamination in potable water

Challenges:

- Non-traditional threat environment
- Immature technologies
- Sampling low level toxics



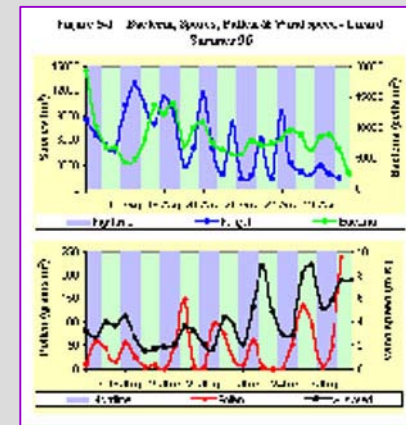
❖ *Model technology downselect process utilized fair assessment of technology candidates from all sources*

Supporting Studies

Objectives: Assemble database of available ambient background data and analyze for key heuristics

Challenges:

- multiple sources of data
- disparities in collection parameters



❖ *Established joint DoD/DOE/TTCP website; data loading and analysis in process*



CB Point Detection Thrust Areas

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Integrated Chem Bio Point Detectors

Objectives: Develop small, hand-size detectors to identify chemical agents and detect/discriminate biological agents

- Challenges:**
- Miniaturization of detector technologies
 - Small, efficient air samplers
 - Simultaneous optimization of size, selectivity, and sensitivity



Pyrolysis-GC/IMS



Optical fluorescence



❖ *Py-GC/IMS demonstrated high detection probability and sensitivity relative to other candidates at JFT-6*

❖ *Air samplers evolving to smaller size with increased efficiency*



CB Standoff Detection Thrust Areas

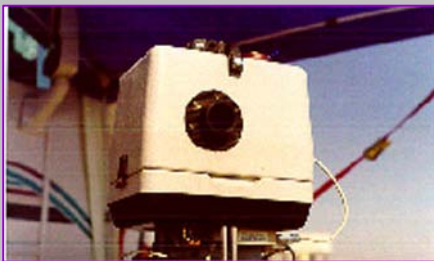
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Chemical Standoff Detection

Objectives: Develop and demonstrate passive and active concepts for remote detection, identification, ranging, and mapping of chemical clouds in all physical forms

Challenges:

- High speed interferometry; focal plane arrays
- Rapid data processing, software
- Laser technology to reduce size, weight of active systems



Chemical Imaging Sensor



JS Warning ID Lidar

❖ *Demonstrated 100 scan/sec operation in field with 9-pixel array passive CIS spectrometer*

Bio Standoff Detection

Objectives: Develop and demonstrate concepts for remote detection, identification, ranging, and mapping of biological particulate clouds

Challenges:

- Laser technology to reduce size, weight of active systems
- Rapid data processing, software
- Spectroscopic technologies to enhance potential for classification



Short-range BSDS

❖ *Initiated panel of experts to develop and down-select concepts for exploration under Bio Standoff DTO*



CB Standoff Detection Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Integrated CB Standoff Detection

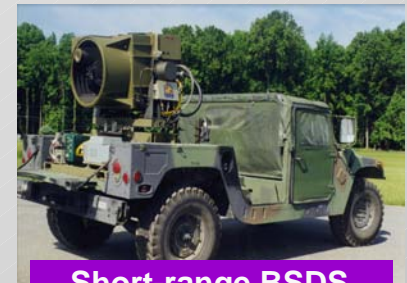
Objectives: Develop and demonstrate concepts for remote detection, identification, ranging, and mapping of chemical and biological clouds in all physical forms with a single sensor platform

Challenges:

- Laser technology to reduce size, weight of active systems
- Significant advances in spectroscopy
- Rapid data processing, software



JS Warning ID Lidar



Short-range BSDS

Merge capabilities into
a single small platform





Individual Protection Thrust Areas

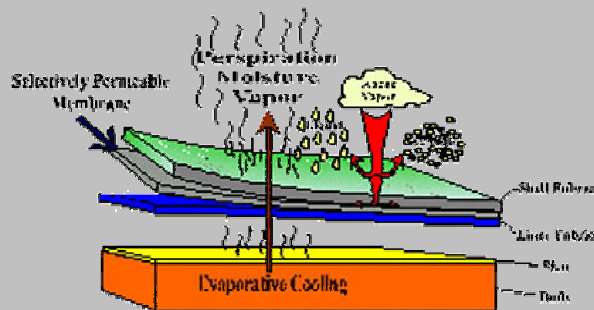
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Clothing

Objectives: Develop overgarments against CB agents that provide increased protection with decreased impediment of wearer's performance

Challenges:

- Selectively permeable materials
- Interface of SPMs with garment fabric
- Testing



❖ *Developed and demonstrated two SPM garments that outperform all fielded garments and are 50% lighter*

Masks

Objectives: Demonstrate concepts that enhance respiratory and head protection against CB agents

Challenges:

- Adsorbent materials
- End-of-service life indication
- TICs/TIMs



❖ *Met or exceeded all JSGPM filter goals*



Collective Protection Thrust Areas

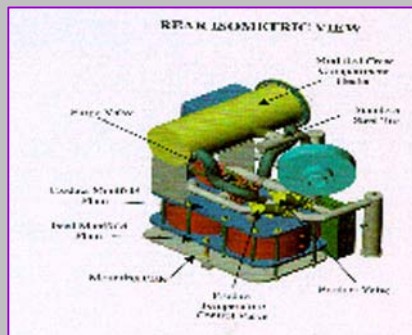
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Filtration

Objectives: Develop filtration approaches that reduce frequency of filter changes and are applicable to all toxic materials

Challenges:

- residual life indicators
- filter regeneration
- biological filtration



❖ *Completed evaluation of filter adsorbents against TICs*

Shelters

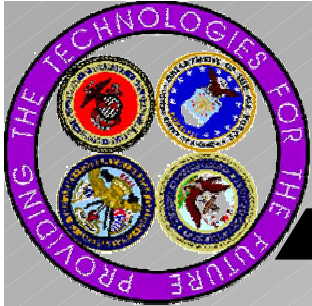
Objectives: Develop collective protection shelters with improved environmental isolation against threats from CB and toxic materials

Challenges:

- Hermetic seals
- Rapid deployment



❖ *Transitioned low cost tentage effort to JTCOPS*



Decontamination Thrust Areas

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Sensitive Equipment

Objectives: Decontaminate sensitive equipment, interiors of combat vehicles and aircraft, and interiors on the move.

Challenges:

- Identify freon alternatives
- Material compatibility
- Man-portable, on-the-move decon
- Agent destruction following removal



❖ *Conducted technology assessment and identified leading candidates for JSSED program. Identified hydrofluoroether as freon alternative.*

Solid Phase

Objectives: Investigate and validate cost effective deactivation and destruction of CW agents rapidly by solid matrices. Extend technology to areas beyond sorbent decon.

Challenges:

- Mass transfer constraints
- Enhance chemical reactivity



❖ *Measured kinetics of VX, GD, and HD on nanosize calcium oxide and aluminum oxide. Autocatalytic for HD elimination process.*



Decontamination Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Solution Chemistry

Objectives: Develop decon systems that supplement or replace existing systems used for immediate, operational and thorough decon and to replace DS2 and aqueous bleach in thorough decon applications.

Challenges:

- Optimize chemistry - co-solvents
- Stabilize the system
- Peroxide logistic issue



❖ *Candidate formulations have been identified that react rapidly and effectively for HD, GD, and VX.*

Enzyme Reactants

Objectives: Develop and demonstrate a new generation of CB warfare agent decontaminants that are non-toxic, non-corrosive, non-flammable, environ. safe and lightweight.

Challenges:

- Identify appropriate enzymes
- Genetic engineering needed for large scale production
- Maintenance of catalytic activity

Sub-thrust
to solution
chemistry



❖ *Increased activity on enzymes with activity for V-agents by 10-fold over baseline. Identified materials technology approach to destroy H-agents.*



Supporting Science and Technology Thrust Areas

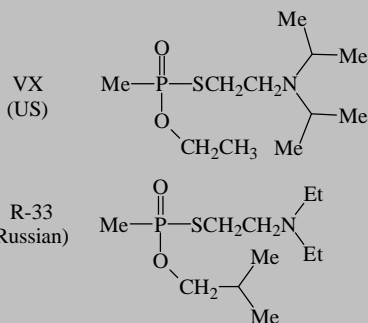
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Threat Agents

Objectives: Maintain awareness of evolving threat agent materials and conduct R&D studies to validate and characterize, and to assess fate of CB materials in environment

Challenges:

- ever expanding array of threats
- infrastructure issues
- identification of adequate simulants



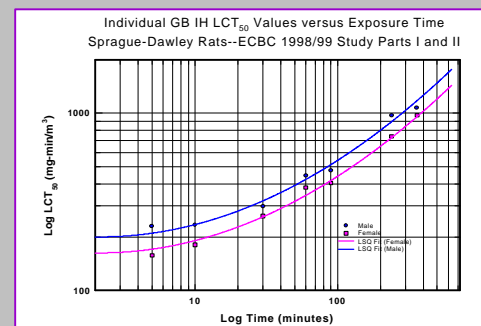
❖ *Conducted multiagency workshop on bioaerosol threat*

Low-Level Operational Toxicology

Objectives: Develop sound values for exposure levels having physiological impact below acute response levels to guide development of detectors and protective equipment

Challenges:

- Identifying physiological indicators of low level exposure
- Developing exposure methodologies
- Extrapolating to human response



❖ *Extend CT range for acute effects*



Supporting Science and Technology Thrust Areas

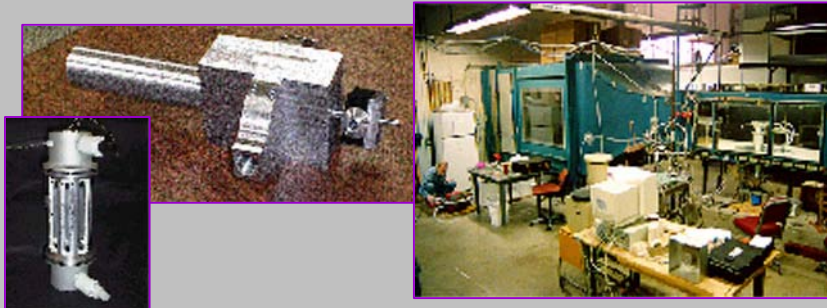
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Aerosol Technologies

Objectives: Characterize and test developmental air samplers/collectors; evolve new concepts toward next-generation small air samplers

Challenges:

- high velocity test challenges
- size, power required to sample large volumes



❖ *Developed isokinetic, isoaxial reference reference sampler; developed new microslit transpired impactor*