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DTRA Research & Development Enterprise Overview

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***Pacific Operational Science & Technology Conference
July 16, 2008***

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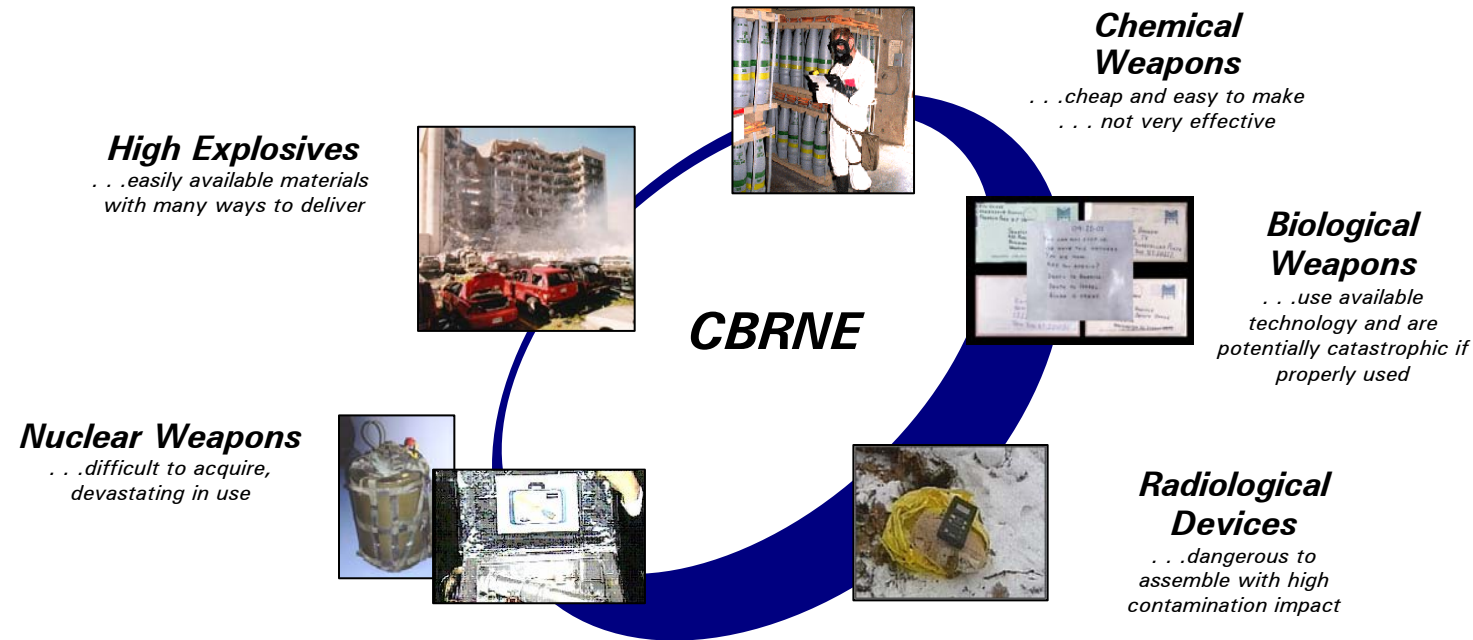
Overview

- **Mission and Organization**
- **Investment Strategy**
- **Top Challenges and Major Programs**
- **Technologies Transitioned to the Warfighter**
- **Future R&D**



RD Enterprise Mission

- Identify, conduct, and deliver innovative science and technology, through systematic, risk-balanced processes, that enable America to combat Weapons of Mass Destruction. Our system engineering activities provide for research, development, and acquisition to support the needs of Combatant Commanders, Services and DTRA





RD Enterprise Portfolios

Nuclear Technologies RD-NT

- Mission: Research, develop and demonstrate technologies and capabilities to mitigate the threat and/or effects of nuclear and radiological events; and to enhance the safety, security, survivability, and performance of U.S. nuclear assets and facilities

Nuclear Forensics
Ground Sample Collection ATD



Counter WMD Technologies RD-CX

- Mission: Research, develop and demonstrate innovative technologies and capabilities to actively counter the full spectrum of CBRNE threats

Combating Terrorism
Prevention of Structural Collapse



Chem/Bio Technologies RD-CB

- Mission: Manage and integrate the development, demonstration, and transition of timely and effective chemical and biological defense solutions for the Department of Defense, while serving as the focal point for science and technology expertise

Automated extraction



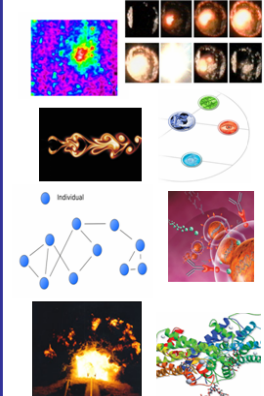
Rapid Diagnostics



Basic and Applied Sciences RD-BA

- Mission: To foster and enable farsighted, high payoff research to reduce, eliminate, counter and mitigate the effects of weapons of mass destruction (WMD) by:
 1. Advancing fundamental knowledge and understanding in the sciences
 2. Utilizing best practices in systems engineering

FY2007 6.1 Topics





Technology Innovation

RD Innovation Office - Advance a work environment that creates new ideas, concepts and capabilities to solve hard problems for the Combating WMD mission

International Collaboration



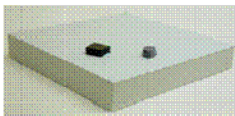
Small Business Innovation Program



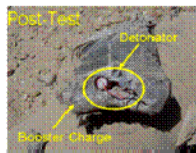
Broad Agency Announcement



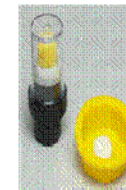
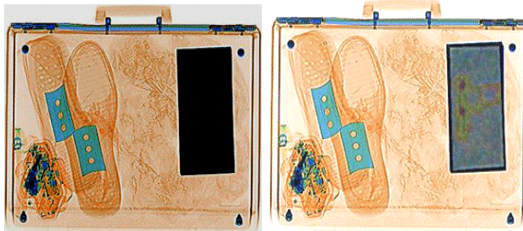
Discovery of Innovative Technologies and Capabilities



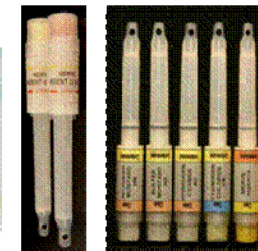
Novel Counter IED Tools
State-of-the-art Technology



Pixel Interrogation
Hunter / Gatherer of Ideas

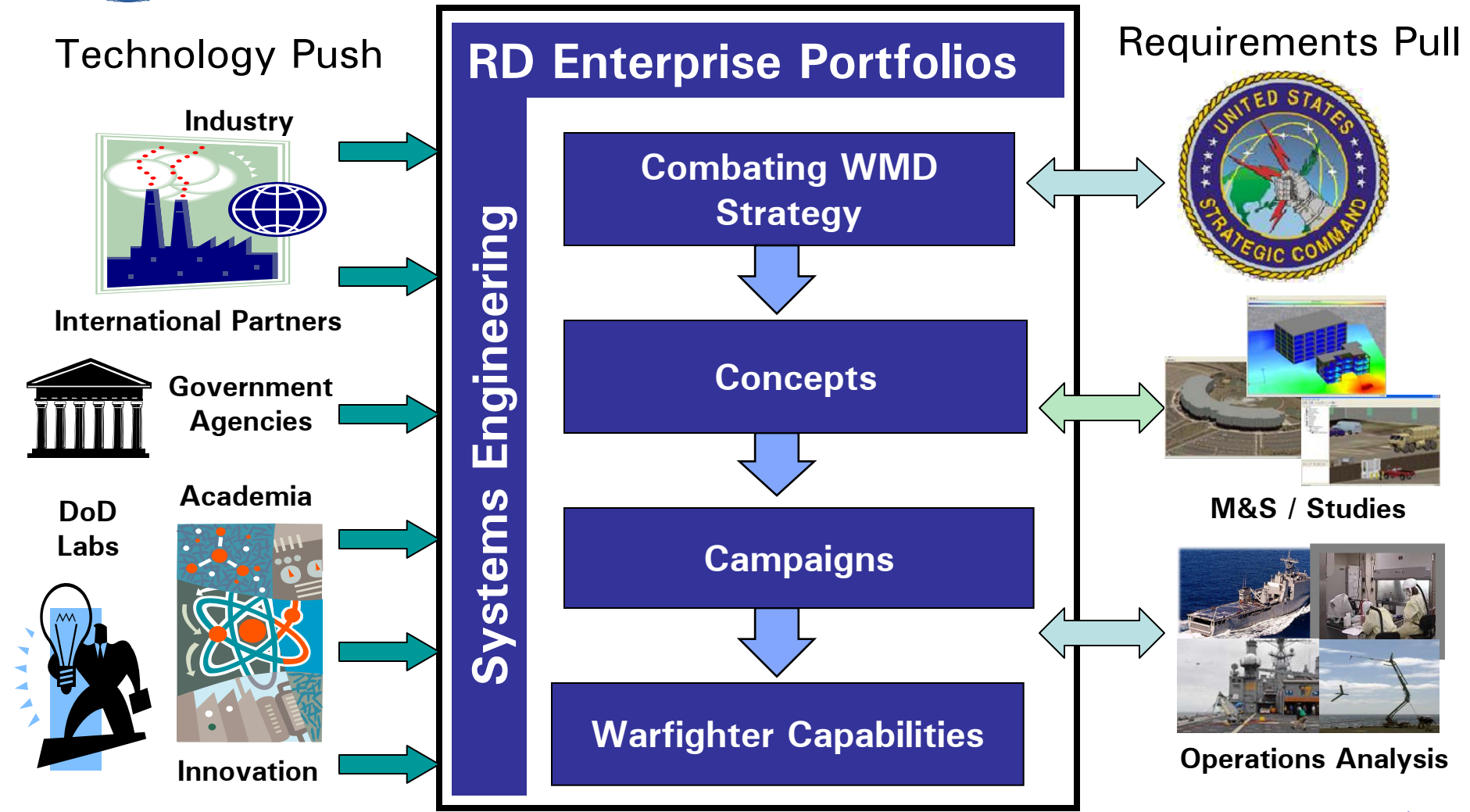


Chemical Detection Badge
Market Research





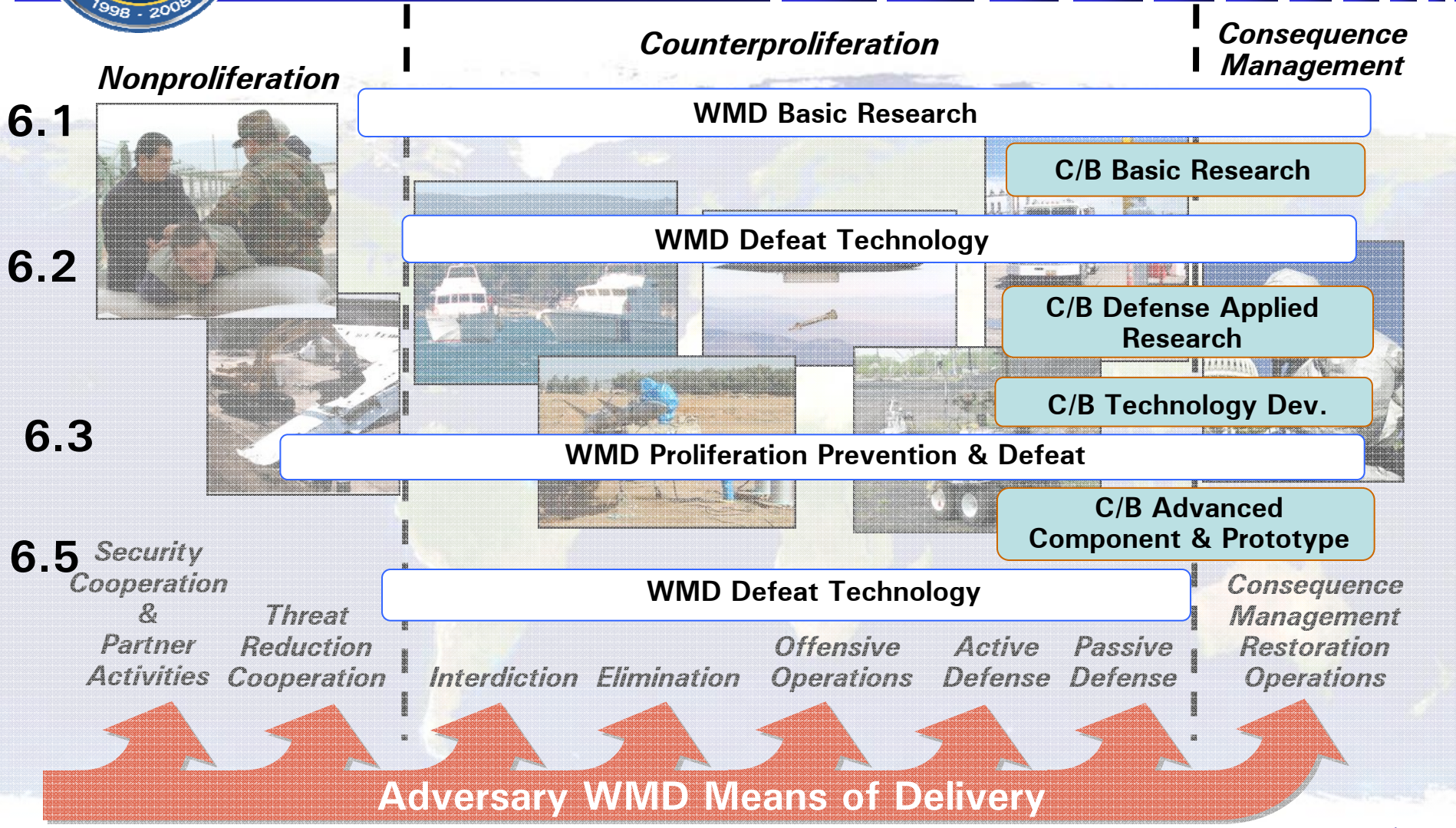
R&D Coordination and Integration





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R&D Integration Into Combating WMD Mission

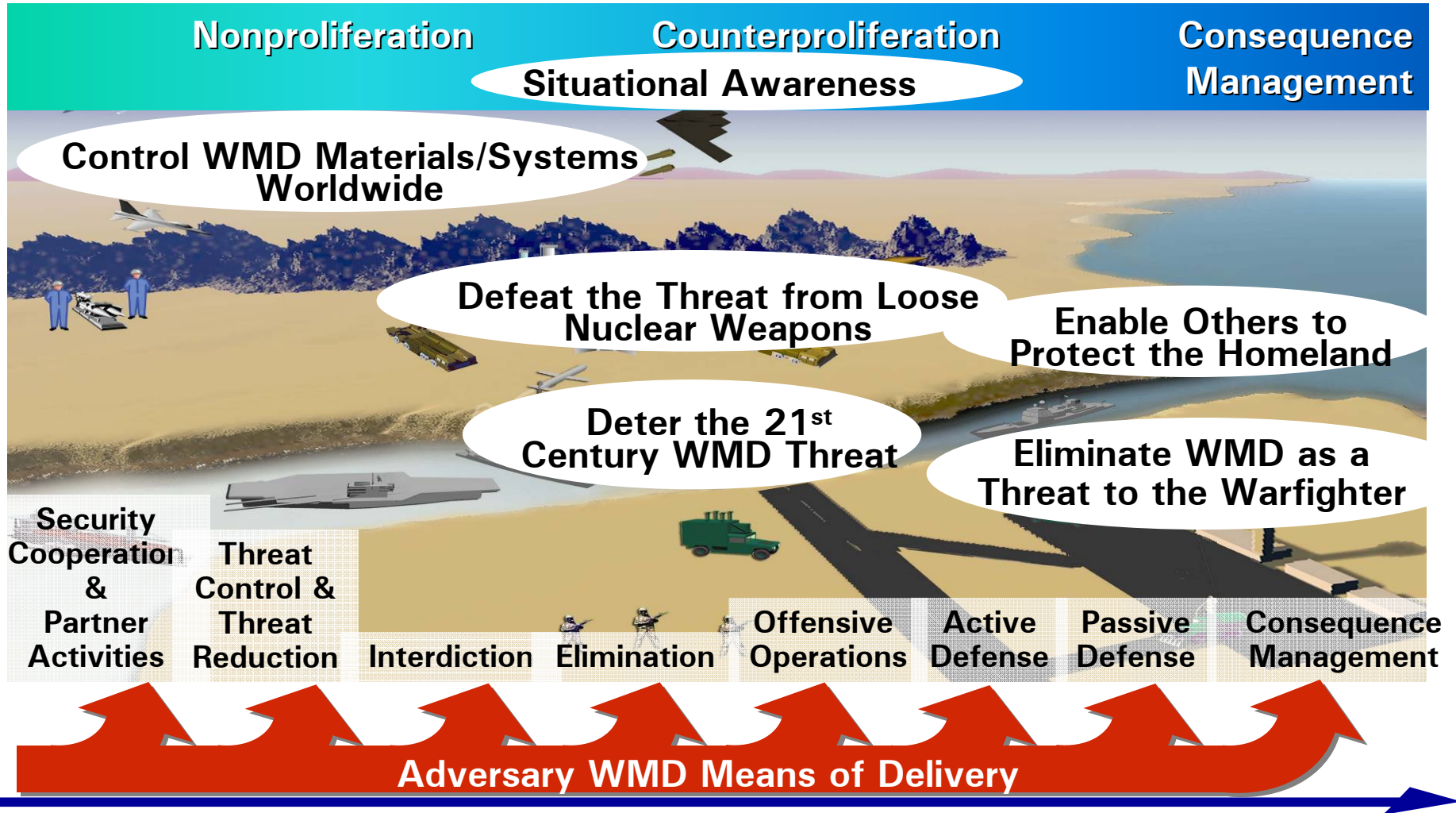


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Campaigns Provide an Integrated Approach to Combating WMD



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R&D Investments by Campaign

1. Situational Awareness

End State

Improve knowledge and information to permit execution of successful courses of actions



R&D Investments

- *Common operating picture for interagency connectivity and an integrated architecture*
- *Decision support/ predictive CBRNE decision support tools*
- *Strategic assessment*
- *CBRNE and Protection & Mitigation Assessment tools*

2. Control WMD Materials and Systems Worldwide

End State

Provide effective tools to prevent proliferation of WMD and WMD related capabilities



R&D Investments

- *Nonproliferation training tools for arms control/confidence and security building measures*
- *Regional training tools (customs, culture, language)*
- *Doctrinal and planning support tools*
- *Sensors and detectors*
- *Train-the-trainer systems*

3. Eliminate the Threat of WMD to the Warfighter

End State

Provide an integrated capability to eliminate the WMD threat to the Warfighter



R&D Investments

- *Personnel Protection Equipment*
- *System survivability in environments where WMD use has occurred*
- *Response, mitigation and restoration in contaminated areas*
- *Technology and subject matter expertise to identify vulnerabilities*



R&D Investments by Campaign

4. Protect the Homeland from WMD

End State

Improve defense support of civil authorities through shared training, planning, tools, and technologies



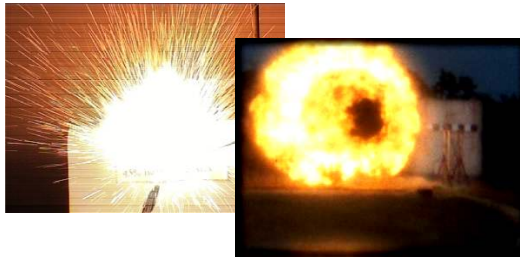
R&D Investments

- CBRNE decision support tools
- Bio-surveillance
- Radiation hardening technologies
- Blast mitigation technologies
- Bio-medical prophylaxes
- CBRN treatment technologies
- CM and restoration technologies

5. Transform the Deterrent

End State

Establish DTRA role in supporting USSTRATCOM as it transforms the nuclear deterrent.



R&D Investments

- CBRNE decision support tools
- Sensors and detectors
- Experimentation facilities
- Test/experimental instrumentation
- M&S of weapons effects
- Specialized weapon designs for combating WMD
- Advanced energetics

X. Defeat the Threat of Loose Nuclear Weapons

End State

Provide an integrated capability to eliminate the threat from loose (lost or stolen) nuclear



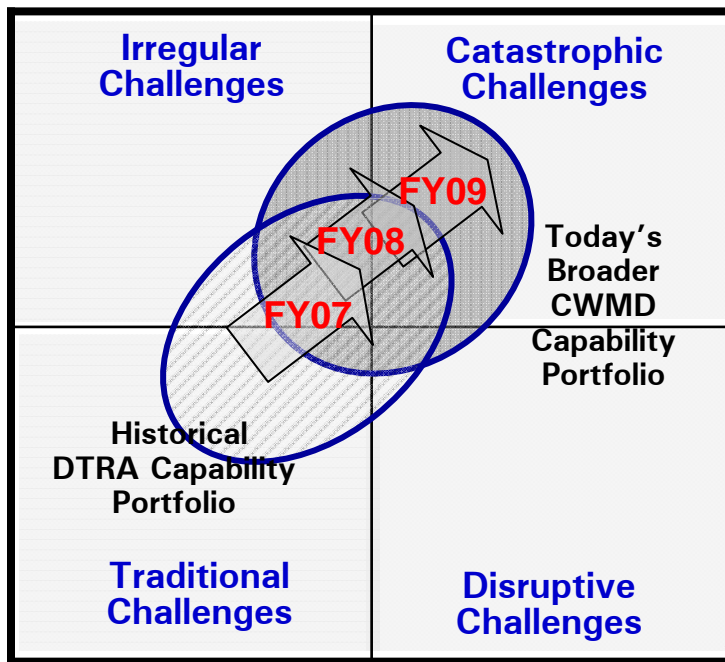
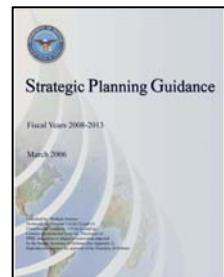
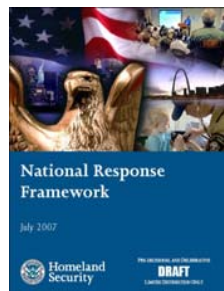
R&D Investments

- Common operating picture
- Sensors and detectors, fixed sites and portable applications
- Specialized weapons design
- Doctrinal support
- Strategic assessments
- CBRN neutralization and destruction technologies



Top Challenges and Program Areas

The complexity and evolution of the threat demands that we change our investment to meet the most pressing challenges



Evolution of R&D Efforts
 Transformational Goal - Reduce the time to close capability gaps

Top Program Areas

- Technology Innovation
- Deployable Technical Intelligence Laboratory
- Nuclear Forensics
- Nuclear Survivability
- Hard & Deeply Buried Targets
- Hardened Target Research & Analysis Center (HTRAC)
- Advanced Energetics for Weapons
- Counter WMD Analysis Cell (CWAC)
- WMD Threat Research and Analysis Collaboration (WTRAC)
- Chem/Bio Applied Technology Dev
- Transformational Medical Technologies Initiative
- Basic Research Engagement



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Concept

Deployable Technical Intelligence Laboratory

- **Modular**
 - Adaptable to meet requirements
- **Mobile**
 - Rapid deployment
 - At-the-ready set up
- **Self Contained**
 - Generator power
 - Climate control
 - Outfitted with ruggedized state of the art equipment
- **Multifunctional**
 - Administration
 - Electronics
 - Analysis
 - Satellite communications



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State and Local Forensic Challenges

- National Emergency Response (9/11)
- Catastrophic events, WMD or natural disasters (Katrina)
 - Resources burdened beyond capabilities
 - Supplementing functional laboratories to reduce backlog



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DOD-DOJ Partnership

NIJ Mobile Forensic Laboratory

- **Developing a readily deployable forensic laboratory**
- **Examining, identifying, comparing and storing evidence**
- **Linking suspect, victim, and crime scene through analysis of physical evidence**
- **Supporting existing forensic operations in the aftermath of a catastrophic event**



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Communications

Interoperable secure communications capability with a national support infrastructure, including national databases, virtual experts and others within the criminal justice community





Nuclear Forensics

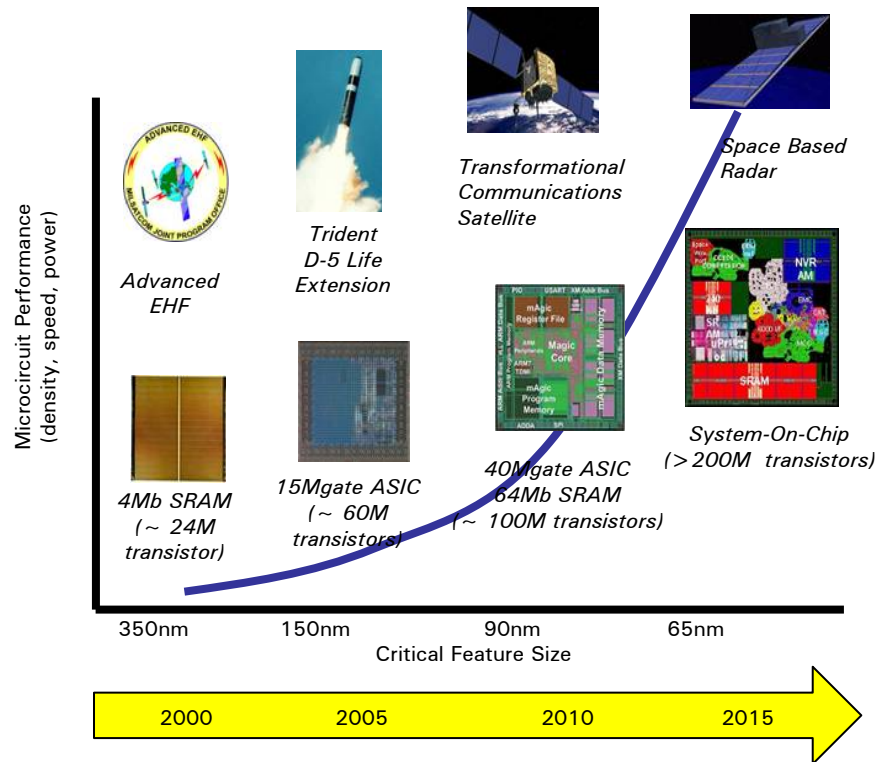
- **Develop a robust (accurate, rapid, and reliable) capability to characterize post detonation materials and prompt data for a nuclear or radiological event**
 - **Prompt Data Collection**
 - Ground-based gamma collection and alternative signatures for yield determination
 - Improved personal protection equipment for manual collections
 - **Sample Debris Collection**
 - Automated collection systems
 - Ground sample Advanced Technology Demo
 - **Sample Debris Analysis**
 - Deployable analytical and screening capabilities
 - Rapid analytical technologies
 - **Data Evaluation & Knowledge Management**
 - Database development
 - Prompt phenomenology data evaluation





Nuclear Survivability

Research that provides leading-edge radiation immune microelectronics for nuclear hardening and survivability of critical defense and missile/space systems



Technical Approach

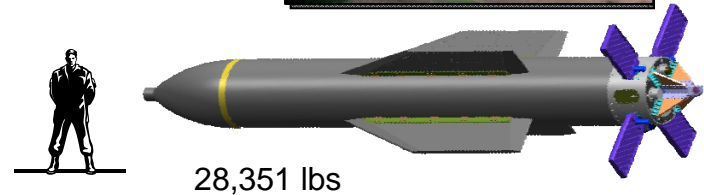
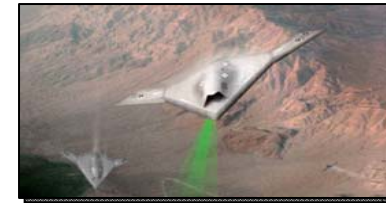
- Develop $\leq 90\text{nm}$ silicon-based technology using industry fabrication processes
- Electronic/computer-aided design methods for very high density integrated circuits
- Enabling technologies for enhanced performance and functionality
 - Non-volatile storage applications
 - Photonics
 - Micro-electro-mechanical systems
 - Non-silicon based technology solutions



Hard and Deeply Buried Targets

Enhance non-nuclear capabilities to put Hard Targets at risk

- **Focus areas - achieve an effective level of lethality in WMD Counterforce Weapons while minimizing Collateral Effects**
 - Conventional (weapons, fills, fuzing)
 - Non-conventional (non-energetic, functional defeat)
- **DTRA activities - define extremes of conventional weapon capabilities**
 - ☑ **Size** - Massive Ordnance Penetrator
 - **Speed** - Precision Global Strike concepts and survivable/smart fuzing
 - **Weapon Payload** - Advanced energetics (enhanced blast) and agent defeat effects





Advanced Energetics for Weapons

Significantly improve weapon effectiveness to attack Hard and Deeply Buried Targets and WMD facilities

- **Near-Term – Advanced Energetics Payoffs**
 - Enhanced blast/thermobarics explosives
 - Reactive materials
 - Shock-dispersed fuels
- **Mid-Term – Additional Payoff from Both Advanced and Disruptive Energetics**
 - All nitrogen and high nitrogen species
 - Advanced multi-functional energetics
 - Shock-dissociated fuels
- **Far-Term – Disruptive Exotic Energetics**
 - Metastable molecular clusters
 - Nuclear spin, shape isomers
 - Small-scale fusion



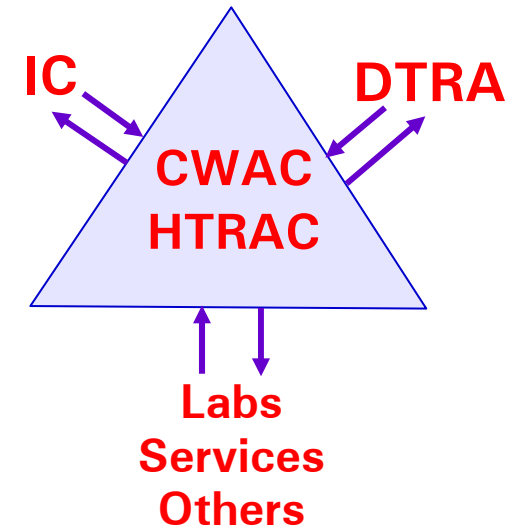


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Counter-WMD Analysis Cell (CWAC) Hardened Target Research & Analysis Center (HTRAC)

Develop new techniques to characterize complex proliferation threats

- **Information Sharing - Collaborative capability that combines intelligence collection and all-source analysis expertise with science and engineering R&D capabilities**
 - Integrate DTRA, Intelligence Community and other expertise in a multi-disciplined effort to address adversary WMD & HDBT developments
 - Develop innovative collection and analysis strategies and technical capabilities to understand adversary WMD & HDBT



- **Strategic/Policy Guidance – HTRAC and CWAC provide opportunities in organizing and integrating counter-WMD analysis**



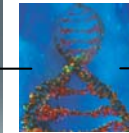
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Chem/Bio Applied Technology Development

Applied Technologies

- Transition mature technologies to advanced developers
- Manage ACTDs, ATDs and JWEs
- Provide technologies in support of installation protection and homeland defense programs

Automated extraction



Rapid Diagnostics



Antiviral for smallpox



Chemical Biological Radiological Nuclear (CBRN) Unmanned Ground Reconnaissance (CUGR) ACTD

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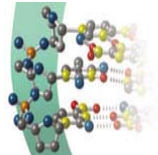
Transformational Medical Technologies Initiative

Revolutionary Technologies to Counter Emerging Biological Threats

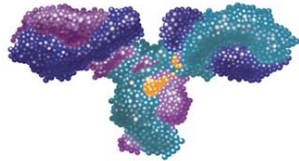
Scientific Thrust Areas



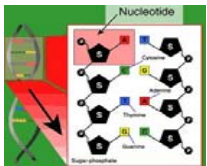
Genomic Identification



Small Molecule Discovery



Protein Based Therapeutics

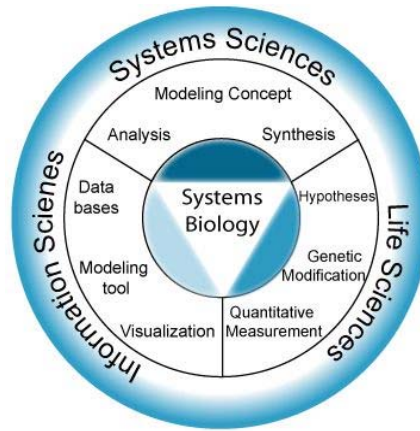


Nucleotide Therapeutics



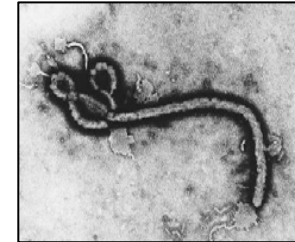
Human Immune Enhancement

Integrated Cross-Cutting Technologies



*Microarray Technology
Bioinformatics
Proteomics
Genomics
siRNA*

Deliverables



Broad Spectrum Treatments

*Hemorrhagic fever viruses
Intracellular bacterial*



Genetic ID & Analysis

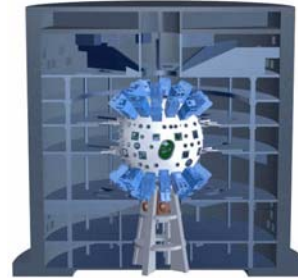
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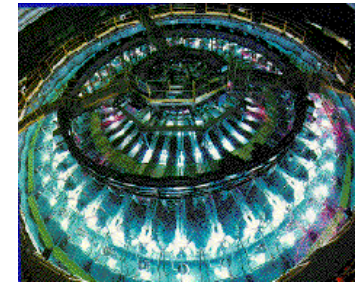
Basic Research Engagement

Through science-based programs attract world-class talent into the WMD S&T research field

- **Basic Research (6.1) Program**
 - Farsighted, high payoff research to reduce, eliminate, counter and mitigate the effects of WMD
 - Invest in combating WMD science with high payoff
 - Balance investment of evolutionary and potential revolutionary advances
- **University Strategic Partnerships**
 - Forge long-term alliances and science partnerships
 - Revitalize the skill base and train the next generation
 - Develop science programs that create flow of new ideas



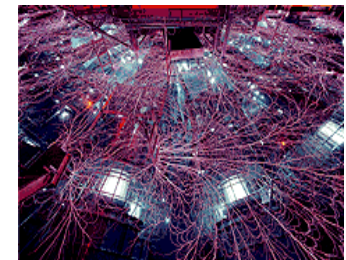
National Ignition Facility (NIF) – Cold/Warm X-Rays (Future?)



Saturn – Hot/Cold X-Rays



Modular Bremsstrahlung Source (MBS) – Warm X-Rays

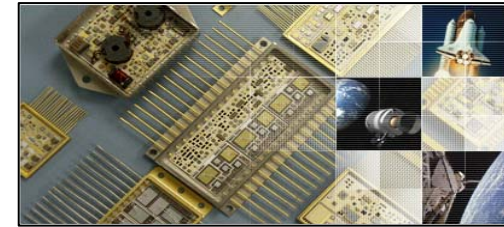


Sandia Z Facility – Cold X-Rays



RD Enterprise Transitions (1 of 3)

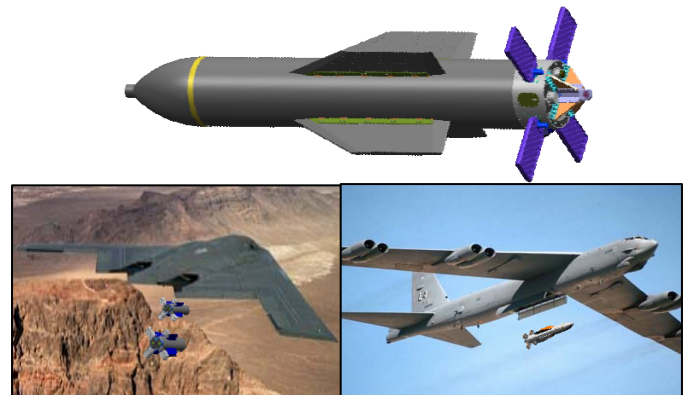
- **Electromagnetic Pulse (EMP) Radiation Hardened Chip Transition to Industry**
 - RH 150nm devices from BAE Systems and Honeywell foundries transitioned to Services
 - Radiation Hardened By Design (RHBD) 90nm technology transition to DoD programs to include TSAT and onboard signal processing development efforts.
- **Thermobaric Weapons (BLU-121 A/B) Transition to AF procurement**
 - USFK - Assets delivered to meet weapon requirement needs
 - USCENTCOM – Additional asset requirements being purchased
- **Integrated WMD Toolset (IWMDT) Transition of Research Tools for Ops Support**
 - Comprehensive capability to incorporate all DTRA modeling and decision support efforts
 - DTRA Operations Enterprise/USSTRATCOM
 - Transition integrated DTRA codes into a net-centric architecture





RD Enterprise Transitions (2 of 3)

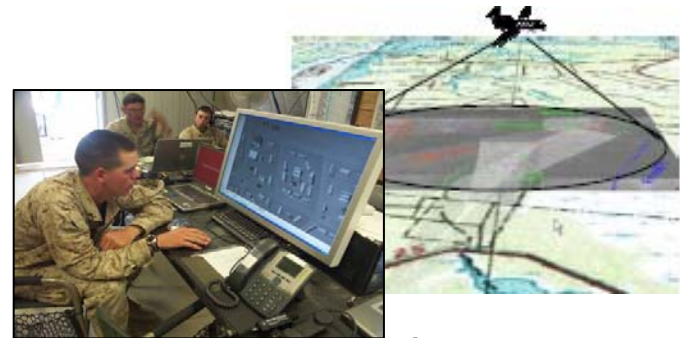
- **Smart Threads Integrated Radiation Sensor (STIRS) JCTD**
 - MPDS - Man-portable detection system (individually worn)
 - VMDS - Vehicle Mounted Detection System (manned/unmanned)
 - ARDIMS - Airborne Radiological Detection, Identification, and Measurement System
 - NORTHCOM is Operational Manager
- **Massive Ordnance Penetrator (MOP) Transition to USAF**
 - Provides critical global strike capability to fight the war on terrorism
 - Transition to Air Force Quick Reaction Capability (QRC)
 - QRC integrates weapon with the B-2





RD Enterprise Transitions (3 of 3)

- **Angel Fire & Constant Hawk Wide-Area Persistent Surveillance Programs**
 - Technologies to transition include:
 - Analysis algorithms
 - Multi-sensor fused visualization
 - Improved SME product generation
 - Next-generation on-board processing/data compression
- **CBRN Unmanned Ground Reconnaissance (CUGR) ACTD**
 - New Joint Contaminated Surface Detection (JCSD) components
 - Updated CBRN Unmanned Ground Vehicle short-range reconnaissance robot
 - Transitioning to the Joint Program Manager for Contamination Avoidance
- **Biological Combat Assessment System (BCAS) ATD**
 - Testing completed in Nov 2007
 - Spiral 2 will include a Chemical/Radiological sensor

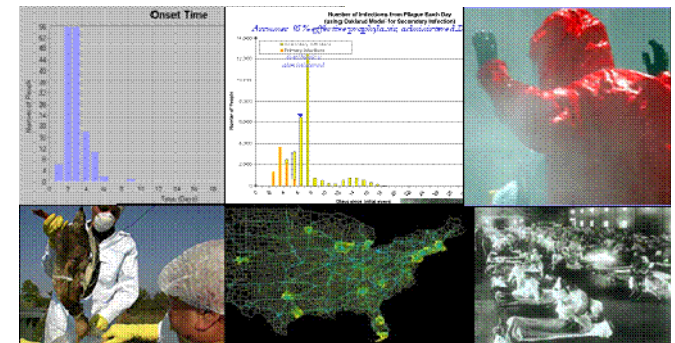
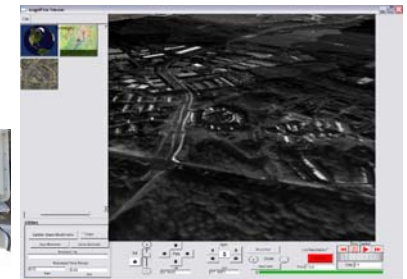




What's Next on the Horizon?

WMD Battle Management Challenge: Provide the warfighter with an enhanced, near real-time, and persistent adversary WMD threat analysis and assessment capability

- **Integration of the three combating WMD pillars (CP, NP, CM)**
 - Integrate the intelligence, sensors, reconnaissance, and consequence management activities
 - Produce common operational picture with net-centric interfaces
 - Implement integration of sensors and taggants
 - Monitor numerous adversary tracks, sensors, and movements to predict hostile intent
- **High Performance Computing for Science-Based Applications**
 - Develop integrated modeling and simulation solutions to CWMD threats
 - Create decision support alternatives for CWMD operations
 - Provide predictive analysis and consequence management





Closing Thoughts...

- RD Enterprise is a major driver of Combating WMD Science and Technology
- Although our focus is on the warfighter, we fully support cooperative work across all agencies
- Major initiatives include: Nuclear detection, Forensics, medical technology transformation, large scale computing for weapons effects, energetics and penetrators
- What's Next? Information integration and fusion, Tracking 100,000 targets, application of large scale modeling and simulation to real-time battle management

...providing COCOMs the tools to defeat the WMD threat!

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Contact Information

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Fort Belvoir, VA 22060-6201

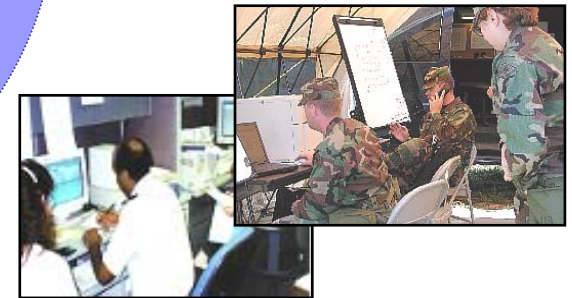
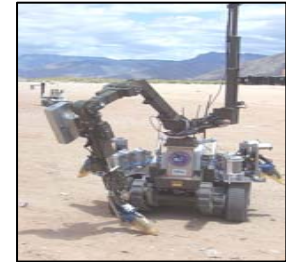
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Summary / Questions

Harvesting technical solutions...



...for the Combating WMD mission