

US Special Operations Command



Continuous Clandestine Tagging, Tracking, and Locating (CTTL)

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The overall classification of this briefing is:
UNCLASSIFIED

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Clandestine Tagging, Tracking, and Locating (CTTL)

- **The Ability to Locate, Track, and Identify Human Beings and Other Important Targets**
- **Directly Supports DoD's Ability to Prosecute the Global War on Terrorism (GWOT)**
- **Forces Require an Ability to Apply and Monitor Tags**
- **Detect and Identify Targets Based on Their Unique Observable Characteristics Without Undue Exposure of Personnel to Risks and With Devices That are Sufficiently Clandestine to be Effective**



Background

This Program Responds to Classified Requirements and Priorities Identified in Several Key Documents.

Examples Are:

- 2003 Hostile Forces TTL Capability Development Document
- 2004 and 2006 Strategic Planning Guidance
- 2004 Defense Science Board Summer Study and Task Force Report
- 2004 Director, Defense Research & Engineering (DDR&E) Assessment of TTL Science & Technology (S&T) Programs
- 2005 USSOCOM/DDR&E TTL Roadmap
- 2006 Quadrennial Defense Review (QDR)
- 2006 Joint Chiefs of Staff (JCS)/J8 Quick-Look Capability-Based Assessment for CTTL
- 2006 Program Decision Memorandum (PDM) III



CTTL

- Funding (\$M) -

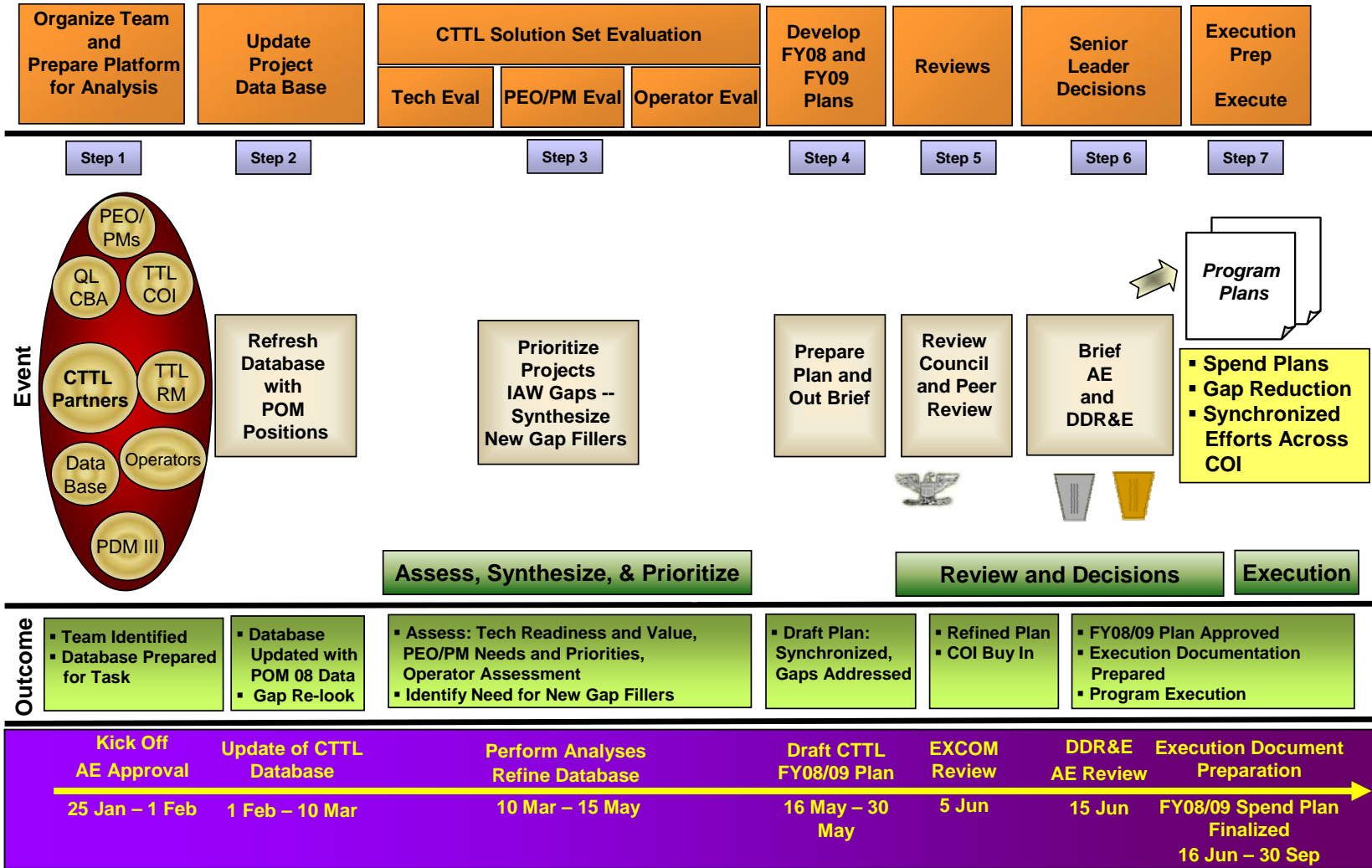
	Appr (\$M)	CTTL Enhancements to Program Elements						
	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	Total
Total	0	25.0	32.1	32.0	33.0	40.0	48.0	210.1

- **Partnership between Assistant Secretary of Defense for Special Operations and Low Intensity Conflict (ASD SO/LIC), USSOCOM, and U.S. Army**
- **Objective:** Conduct a Collaborative Effort to Develop New Capabilities for Clandestine Tagging, Tracking, and Locating in Response to Priorities Established in a Quick-look Capability-based Assessment Conducted in Response to the Findings of the QDR
- **Approach:** Transition Existing State-of-the-Art Technologies in Nanotechnology, Chemistry, and Biology to Operational Systems Through the USSOCOM Acquisition Process and Conduct RDT&E From Basic Research Through Prototyping to Provide Continuous Improvements in the CTTL Technology Available for Transition to the Operators. Specific Capability Projections Are Classified.



CTTL

- Task Force Storyboard -





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- Technical Goals -

- **Reduce the Size, Weight, and Power Requirements for Tags and Sensors to Allow Improved Clandestine Operations**
- **Introduce New Capabilities for Detecting, Identifying, and Tracking Targets Based on Unique Observables**
 - Natural Signatures: e.g. Biometrics and Unique Mechanical Defects
 - Augmentation of Natural Signatures: e.g. “Perfumes” and “Stains”
 - Extend the Range
- **Provide New Mechanisms to Deploy, Monitor, and Manage Clandestine Devices with Reduced Exposure of Operational Personnel**



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- Key Enabling Technologies -

■ Nanotechnology

- Clandestine Devices
- High Functional-density Devices
- Self-organizing, Self-deploying Devices
- Processing and Communications
- Energy Harvesting

■ Biotechnology

- Biomimetic Devices for Detection and Identification (ID) at Long Distance
- Bio-based Devices for Detection and ID at Long Distance
- Taggants for Biological Signature Amplification, Translation
- Natural Signature Detection and ID

■ Chemistry

- Signature Enhancing Taggants
- Chemical/Biochemical Sensors for Natural Signatures



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- Partnership for Transition -

- **DDR&E and USSOCOM AE Executive Sponsorship and Oversight**
- **USSOCOM Transition**
 - PEO-Special Projects
 - PEO-Intelligence and Information Systems
- **Collaborative Execution of S&T**
 - DoD Service Laboratories
 - Defense Advanced Research Projects Agency (DARPA)
 - ASD(SO/LIC) Coordinated Investments
 - Intelligence Community Research Organizations
 - DOE Laboratories



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- Key FY08 Outcomes -

- **Taxonomy of Projects of Interest**

- **17 BA 3**

- **11 BA 2**

- **8 Organizations**

- DARPA

- Communications-Electronics Research, Development, and Engineering Center (CERDEC)

- Night Vision and Electronic Sensors Directorate (NVESD)

- Army Research Laboratory (ARL)

- National Security Agency (NSA)

- Defense Intelligence Agency (DIA)

- Air Force Research Laboratory (AFRL)

- Department of Energy (DOE)

- Industry

- **Fourteen Transitions Projected within 24 Months**



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- Key Events for FY09 -

- **Restart Selection Process**
 - Data Call – Refresh Database
 - Broad Agency Announcement (BAA)/Call for New Project Proposals
 - Administer Selection Process
- **Ground Rules**
 - FY08 Projects Continue on Merit -- Not Previous Selection
 - Order of Merit Algorithm Will Include a Technology Component
 - Projects Must Accomplish All Phases of Process



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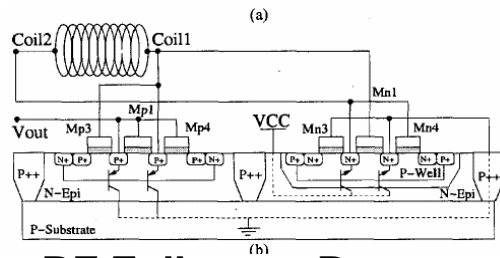
CTTL

- Ambient Energy Harvesting -

Goal: Battery-independent Devices in 3 to 4 Years

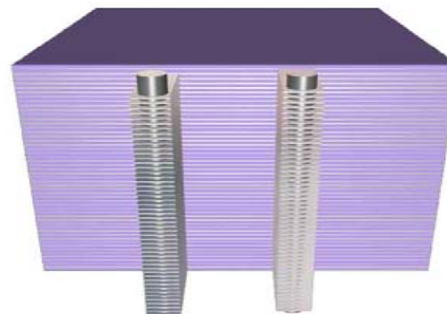
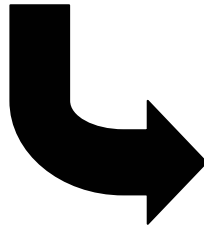
Radiation Harvesting

- RF Rectenna: **Cell Signals**
- Room Source: **60Hz Power**



RF Full-wave Rectenna

Near-term
Solution



Super-capacitor

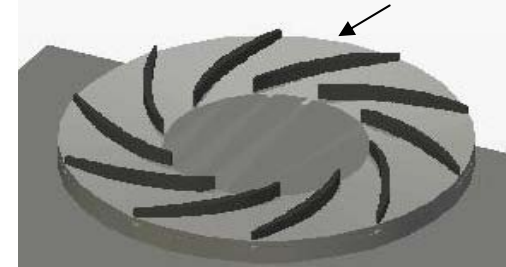
Energy storage

- Super-capacitors: **Capacitor Arrays**
- Electrochemical: **Thin Film Batteries**

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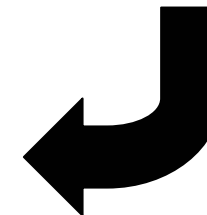
MEMS Harvesting

- Vibration: **Electrostatic Drives**
- Air Flow: **Wind Driven Motor**



MEMS Rotor

Potential
Solution



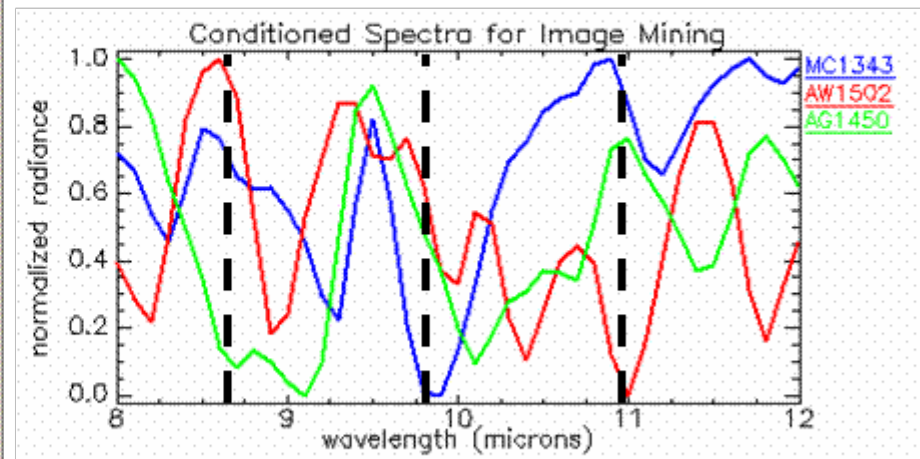
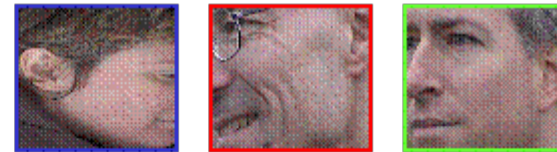
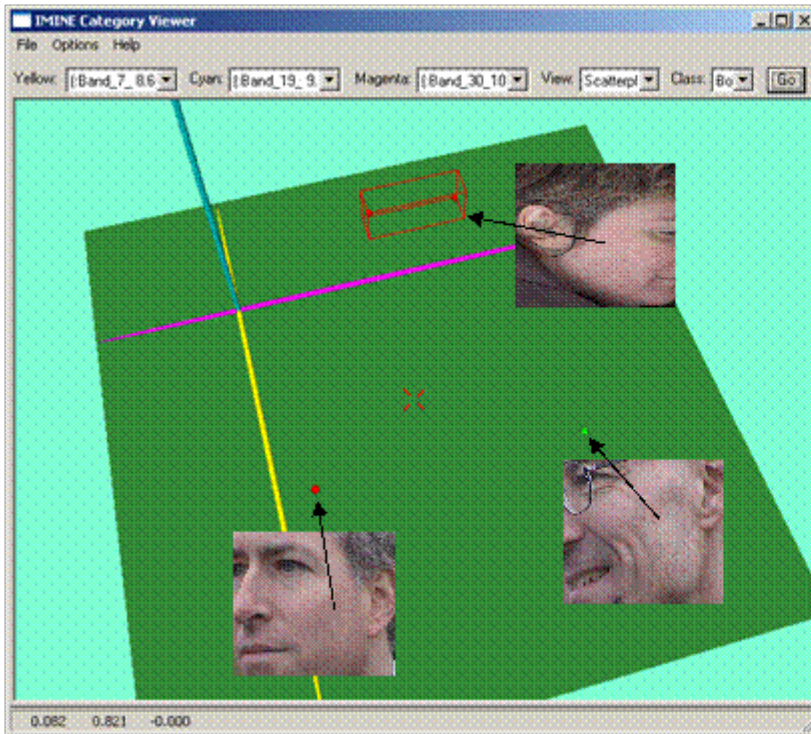


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- Human Signature Detection -

Goal: Verification of Capability and Operational Value Within 2 Years

Human Thermal Fingerprint at Long Distance



- Skin Spectral Emissivities Measured
- Thermal Fingerprints Determined
- “Target” Reacquired 90 Minutes Later

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- Human Signature Detection -

Goal: Demonstration of Fieldable “Bioelectronics” Within 5 Years

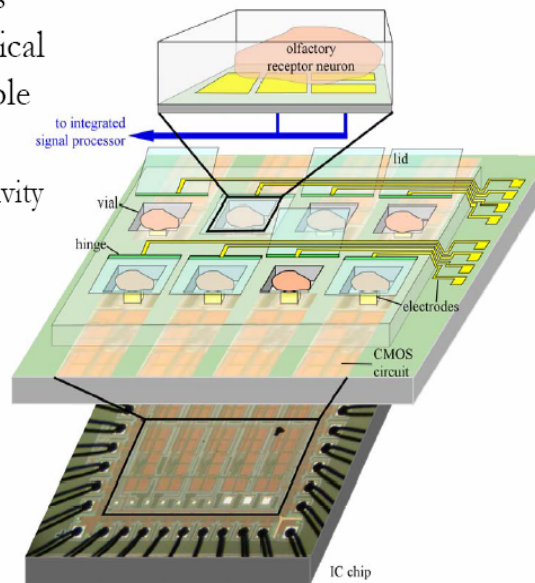
Synthetic Dog’s Nose Sensor



Goal: Cell-Based Sensing



- Develop sensor systems that directly incorporate cells as sensors to transduce chemical stimuli to externally-readable electrical outputs
 - Biological specificity, sensitivity and adaptability
- Develop understanding of constraints and opportunities in cell-based sensor systems
 - Sample delivery, cell health, robustness





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- Signature Amplification/Translation -

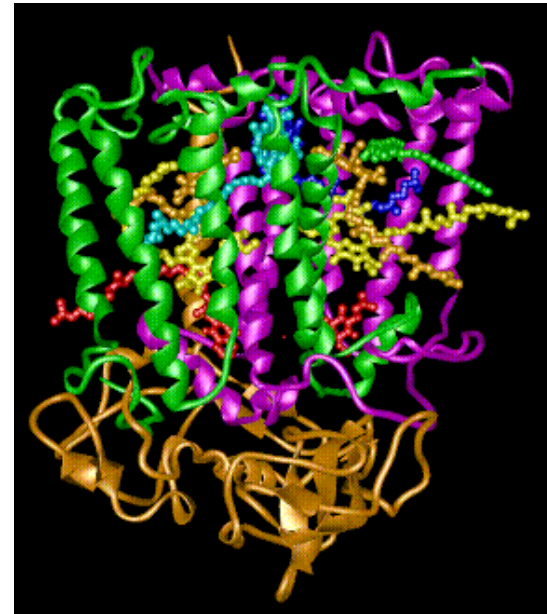
Goal: Move Basic Research to Advanced Development in 3 Years

Current Capability



Bioreactive Taggant

Current Science



Bioengineered Signature Translation

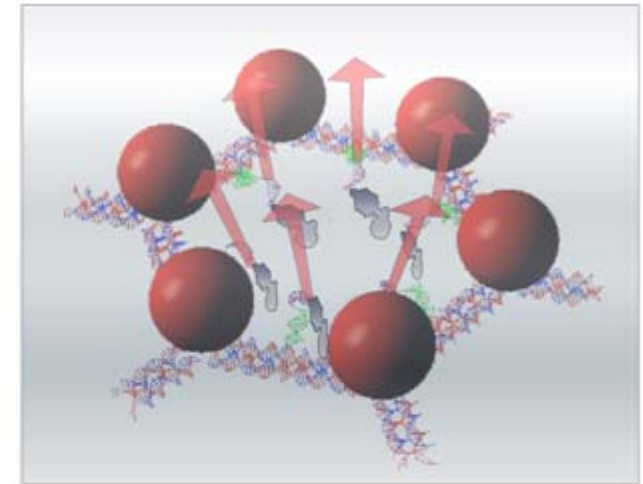
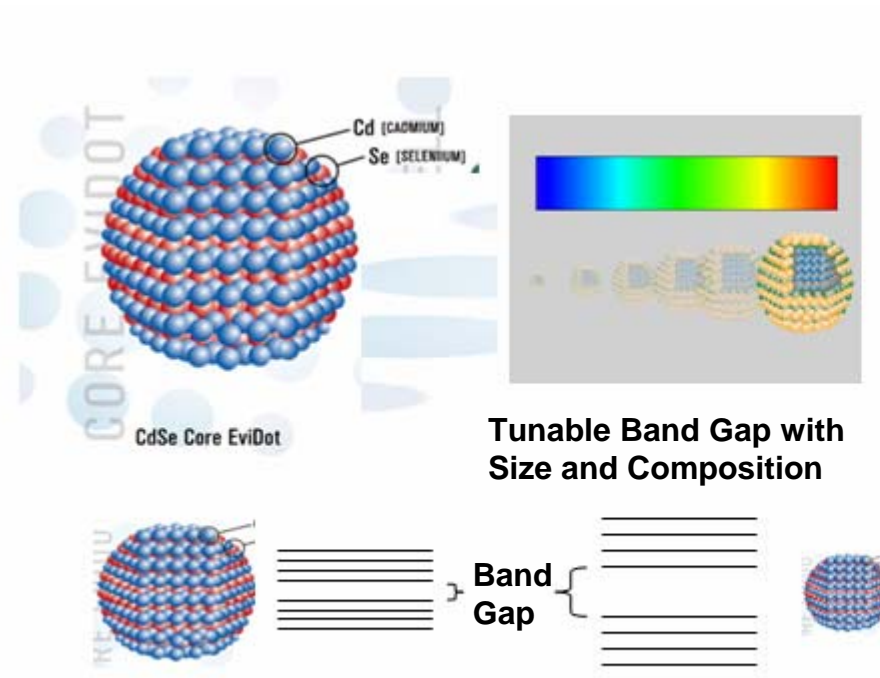


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- Nano-scale Devices -

Goal : Micro-scale in 12 Months, Nano-scale in 4 to 5 Years

Quantum Dots



Self-assembled Photonic Antenna