



# Department of Defense Quadrennial Defense Review and Science and Technology

4 November 2010



# Secretary Gates' Priorities



- 1. Take care of our people*
- 2. Rebalancing the military*
- 3. Reforming what and how we buy*
- 4. Supporting our troops in the field*

*Secretary of Defense, HASC Budget Rollout Brief, February 2010*

***All Suggest New Vectors for Support***

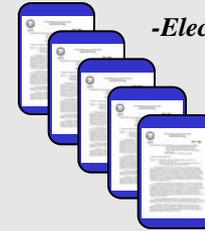


# Director, Defense Research and Engineering Imperatives



1. Accelerate delivery of technical capabilities to win the current fight.
2. Prepare for an uncertain future.
3. Reduce the cost, acquisition time and risk of our major defense acquisition programs.
4. Develop world class science, technology, engineering, and mathematics capabilities for the DoD and the Nation.

## Fast Track Studies



-Electronic Warfare

-Computer Science

-Cyber Operations

-Energy & Water

-Rapid Capability Tool Kit

## Task Forces



Helo Survivability



Base Protection



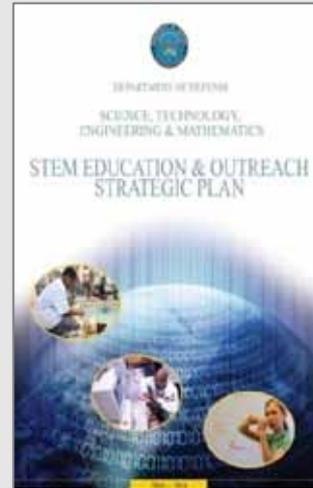
Tag, Track, Locate



C-IED SIG Support



QDR Mission Architectures



Threat sensors mounted to fuselage exterior

Helicopter Alert & Threat Termination-Acoustic (HALTT-A)

ICAF



Sfilletto



MRAP-ATV



PGSS



# DDR&E Imperatives



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# Bringing Capabilities to the Fight



## *Helicopter Alert and Threat Termination-Acoustic (HALTT-A)*



*Threat sensors mounted to fuselage exterior*



**Stiletto**



**MRAP-ATV**



**PGSS**



# DDR&E Imperatives



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# Environment and Context

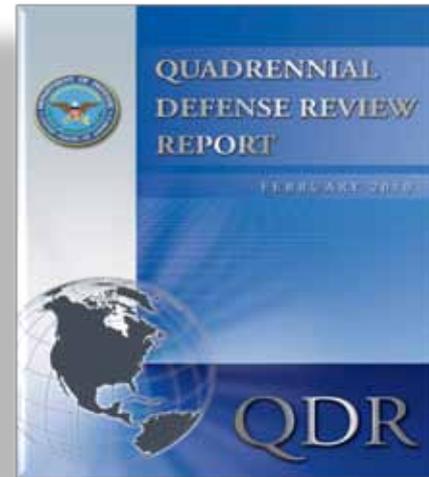
## Defense Science Board 2008 Summer Study

### Capability Surprise



**21<sup>st</sup> Century  
Strategic  
Technology  
Vectors**

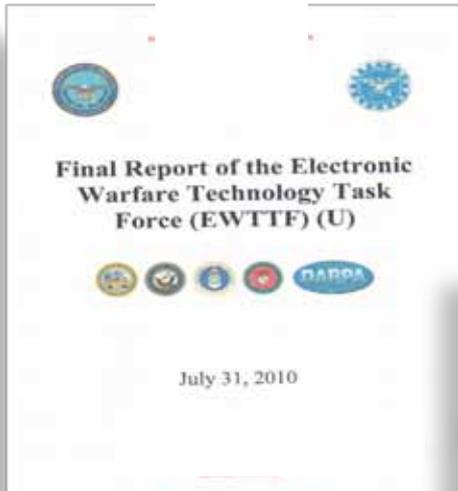
**JASON Study  
on Assuring  
Space-delivered  
Capabilities**



**NSS  
NMS**

**IPLs  
STIPLs**

**OSTP  
FY12  
Priorities**



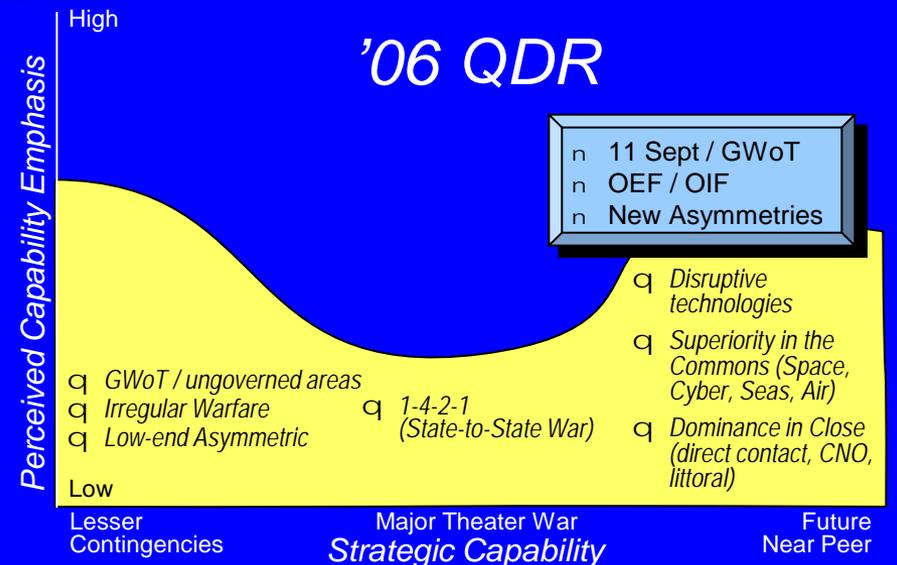
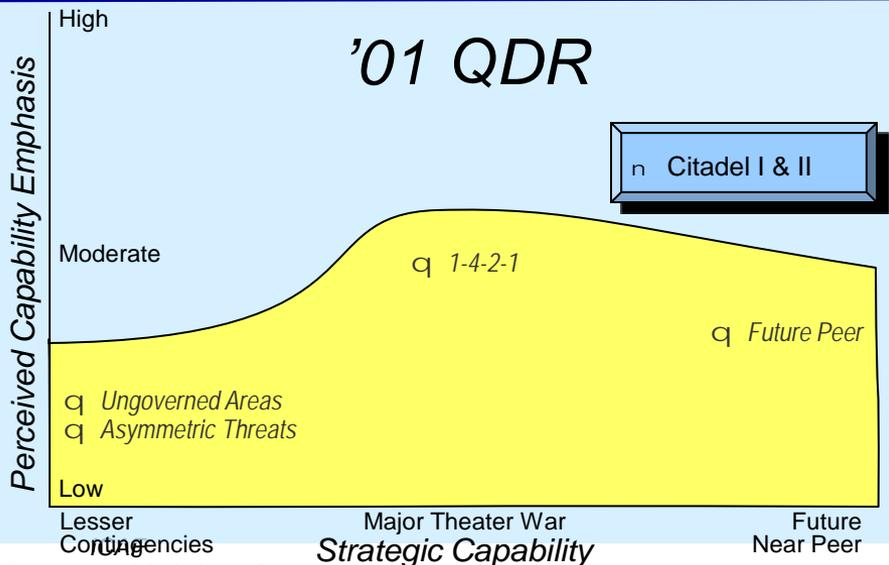
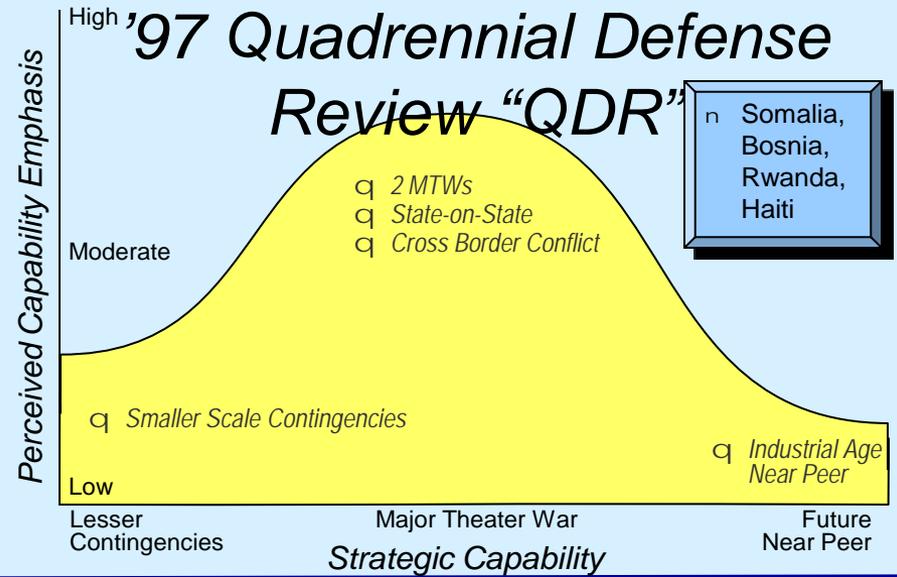
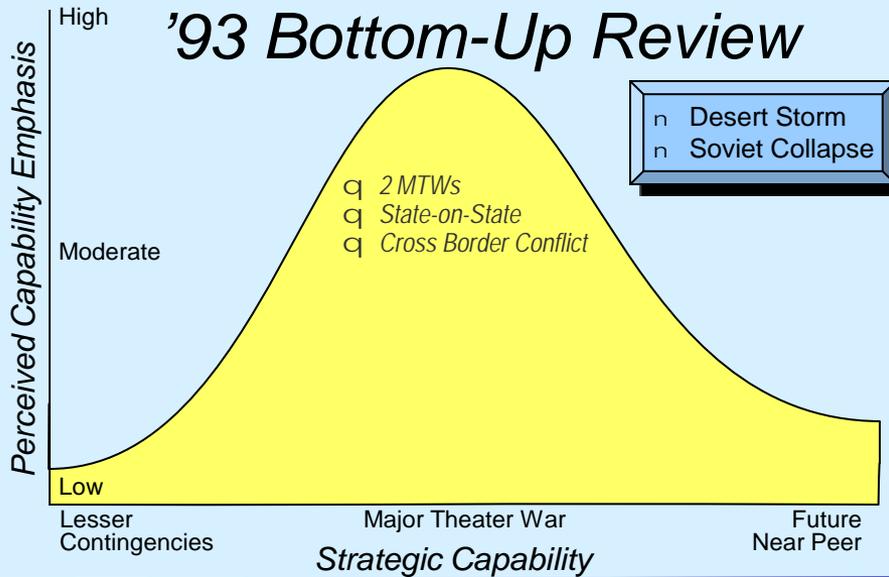
### DPPG

- QDR KMA S&T Studies
- Systems 2020
- Data to Decisions
- Application of Technical S&T Intel

***Biggest issue is deciding which challenges to act upon  
... and to what degree***

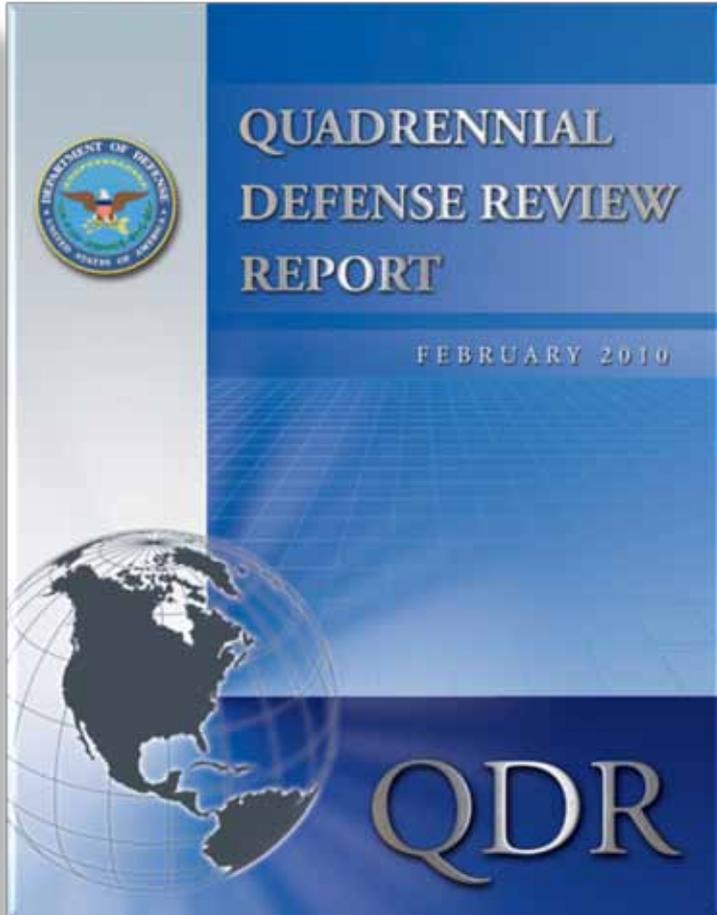


# Decade of Strategic Evolution





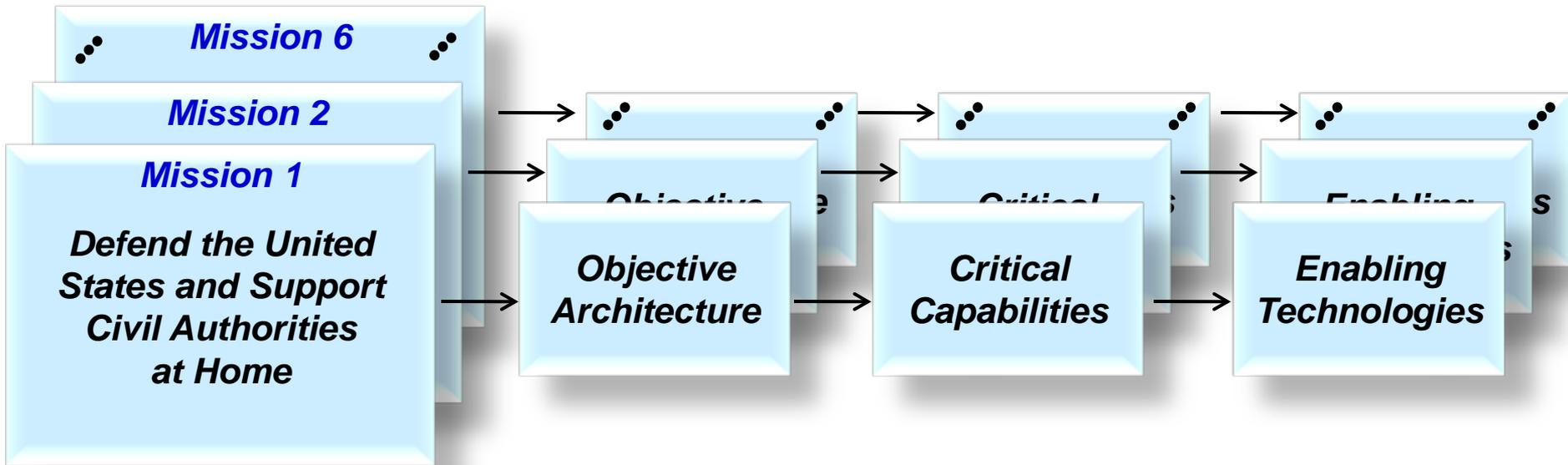
# Quadrennial Defense Review Missions Require New Capabilities



- 1. Defend the United States and Support Civil Authorities at Home*
- 2. Succeed in Counterinsurgency, Stability, and Counterterrorist Operations*
- 3. Build the Security Capacity of Partner States*
- 4. Deter and Defeat Aggression in Anti-Access Environments*
- 5. Prevent Proliferation and Counter Weapons of Mass Destruction*
- 6. Operate Effectively in Cyberspace.*



# Approach



*Strategy-focused, QDR-scoped, capability-driven front-end technologies*

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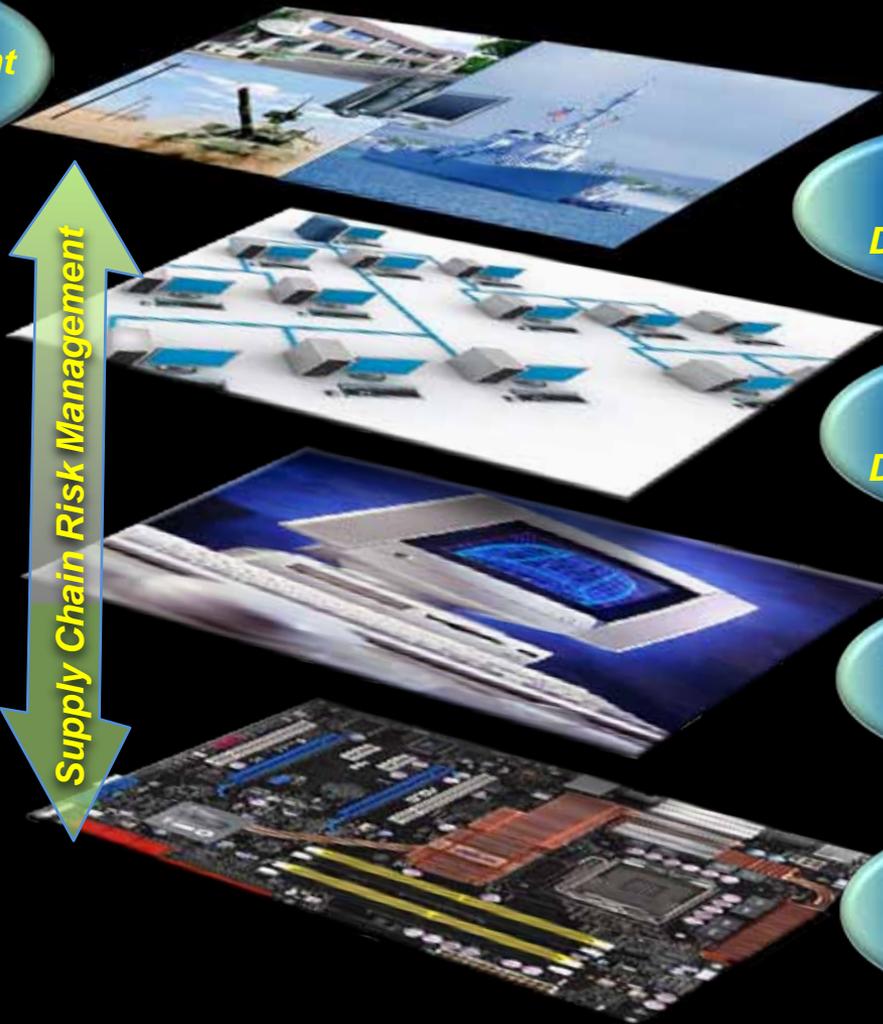
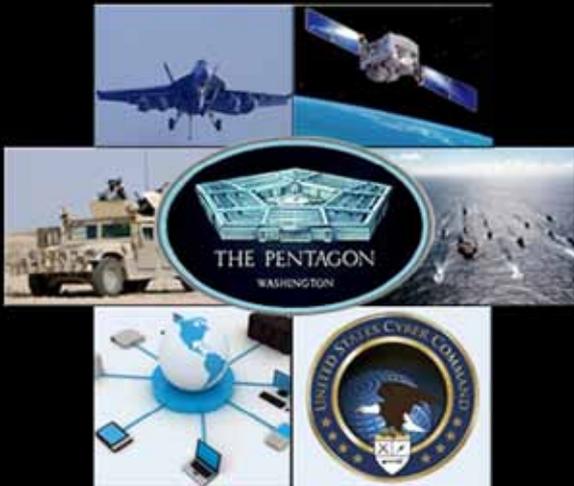


# Operate Effectively in Cyberspace

(OV-1: High Level Operational Concept)



**Fight Through Any Cyber Event and Prevail**



**Supply Chain Risk Management**

**Enhance Trust & Confidence in Data & IT Services**

**Dynamically Defend DoD Cyberspace**

**Detect & Counter Insider Threats**

**Detect & Counter Advanced Persistent Threats**

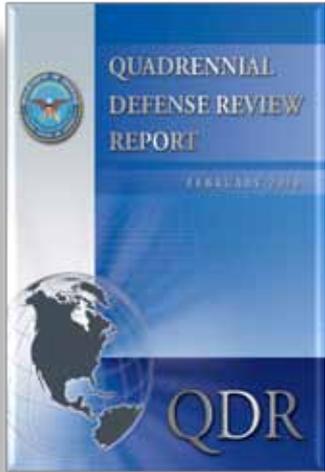
## Scenario:

**Defending in a cyber environment contested by nation-states or other sophisticated adversaries**

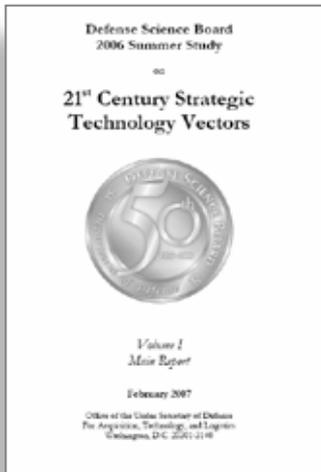
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# Critical Capabilities That Evolve from Architectural



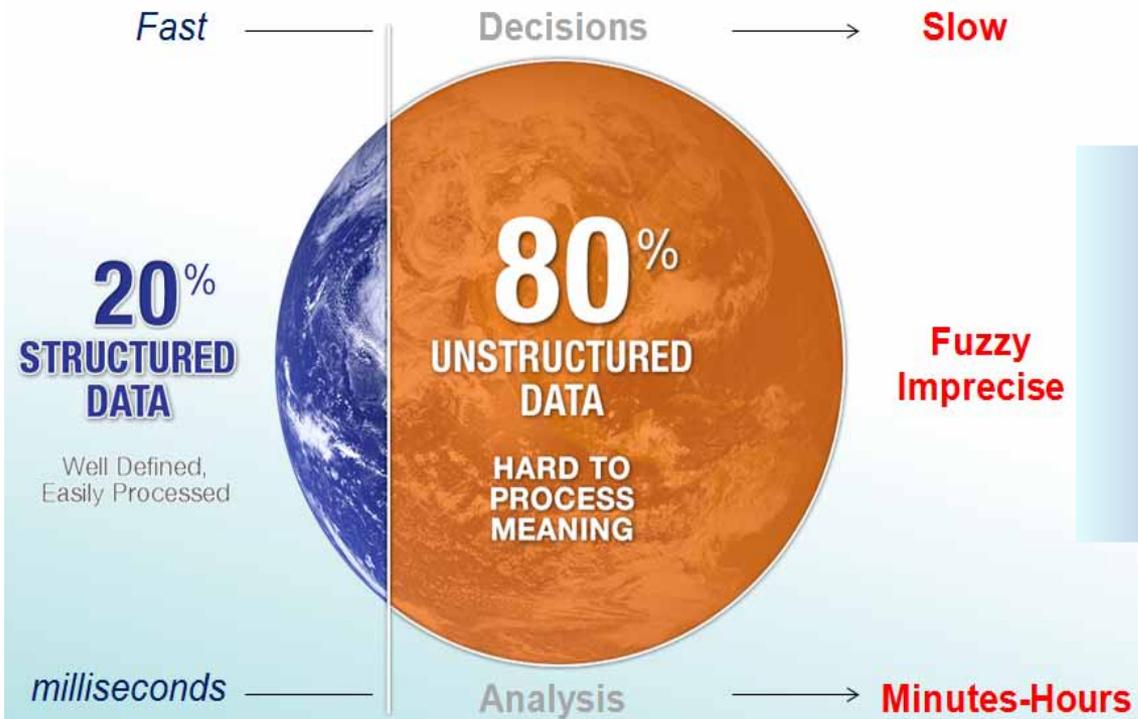
1. **Decision Support (Data to Decisions)**
2. **Autonomy for Standoff, Speed and Scale**
3. **Trusted Cyber and Cyber-Physical Systems**
4. **Immersive Training**
5. **Human Terrain Preparation**
6. **Ubiquitous Observation**
7. **Contextual Exploitation**
8. **Rapidly Tailored Effects**





# Data to Decisions

Most is Unstructured and Hard to Extract Meaning, Patterns, Trends  
The **Real Time** Web Makes This Even Harder



## RESEARCH TOPICS

- *Data Structure*
- *Anomaly detection*
- *Embedded algorithms*
- *Context*
- *Prediction*

Source: TTI Vanguard Conference - Psydex



# Systems 2020

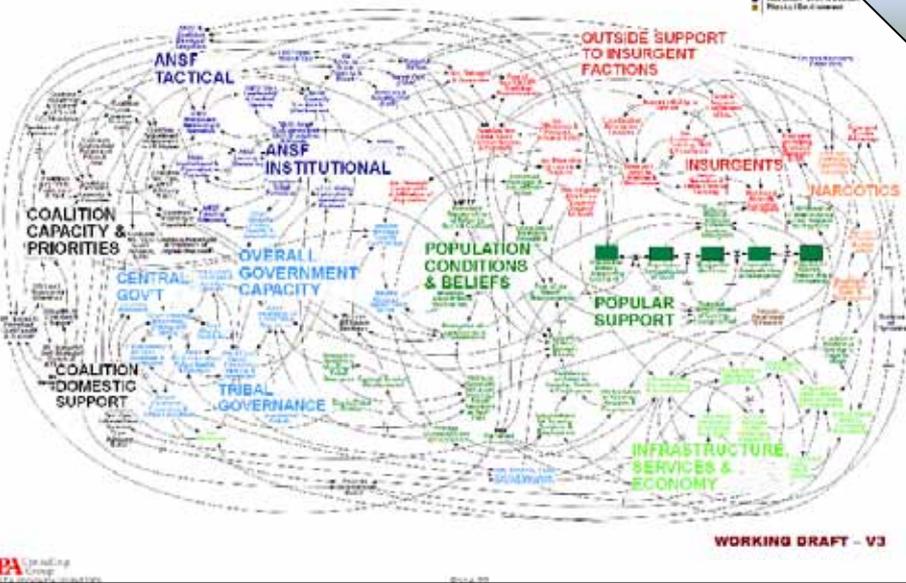
## NEW INTELLIGENT TOOLS & APPROACHES

Engineering Design

Test

Construction

Afghanistan Stability / COIN Dynamics



## Key Technical Challenges

- **Trusted & Assured Systems with components of unknown pedigree**
- **Advanced M&S (Synthesis)**
- **Scaleable and open architectures**
- **Integrated / interoperable design algorithms**

*Trusted – Assured – Reliable - Interoperable*





# Overall Priority Enabling Technology Areas



- **Information Systems Technologies; Knowledge and Information Management / Battle Command (K&IM)**
- **Access to and Sharing of Critical DoD and Government Information/Databases**
- **Alternatives to GPS for Providing Position, Navigation, and Timing (PNT)**
- **Dynamic Electromagnetic Spectrum Management**
- **Locate, Monitor and Track – Operationally Significant CBRN Standoff Detection**
- **Cyber – Foundations of Trust**
- **Immersive, Adaptive Training and Planning**

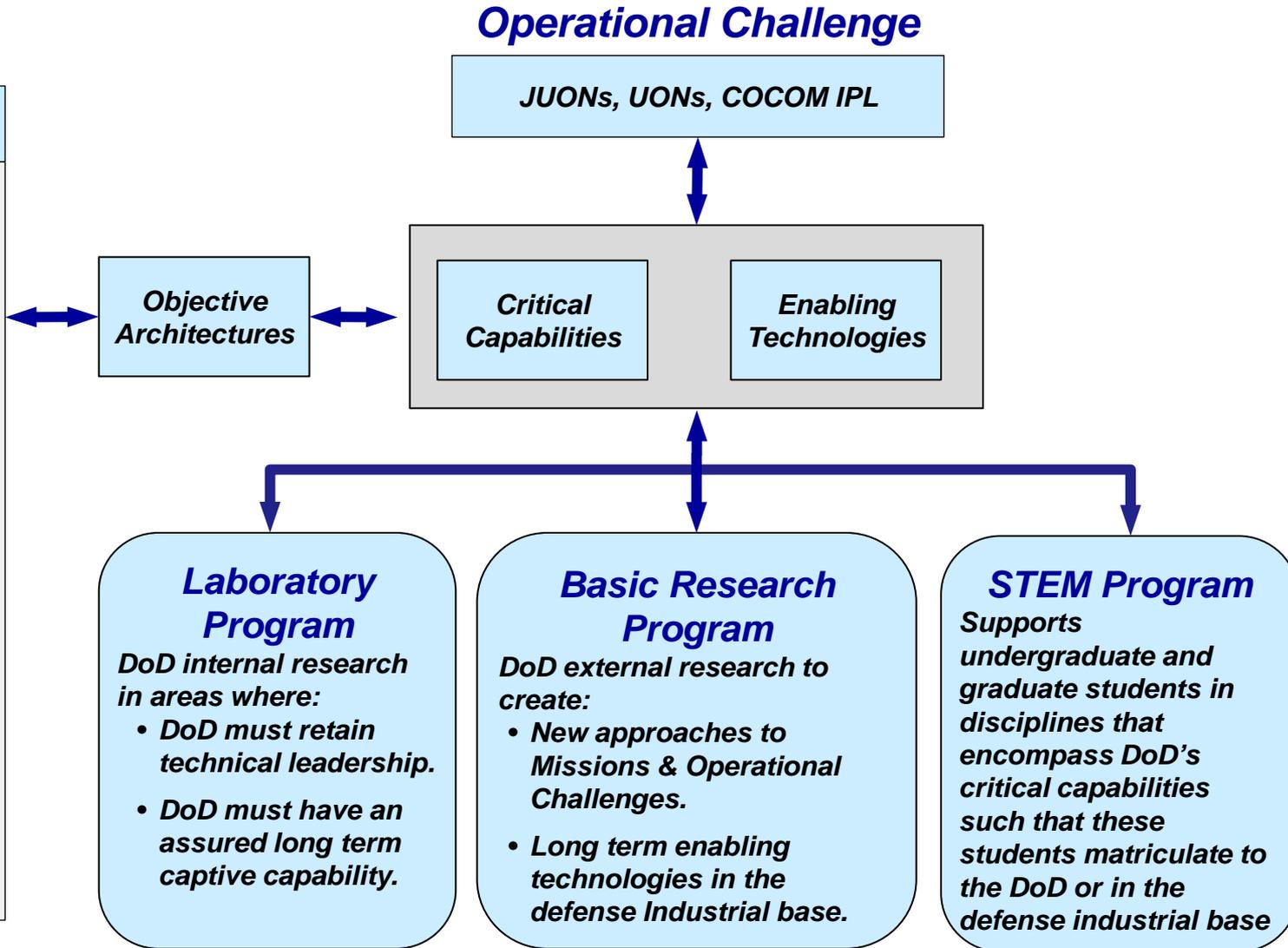


# Integrated S&T Enterprise

## Missions

*NDS, QDR, SPR, NPR*

1. *Defend the United States and Support Civil Authorities at Home*
2. *Succeed in Counter insurgency, Stability, and Counterterrorist Operations*
3. *Build the Security Capacity of Partner States*
4. *Deter and Defeat Aggression in Anti-Access Environments*
5. *Prevent Proliferation and Counter Weapons of Mass Destruction*
6. *Operate Effectively in Cyberspace.*



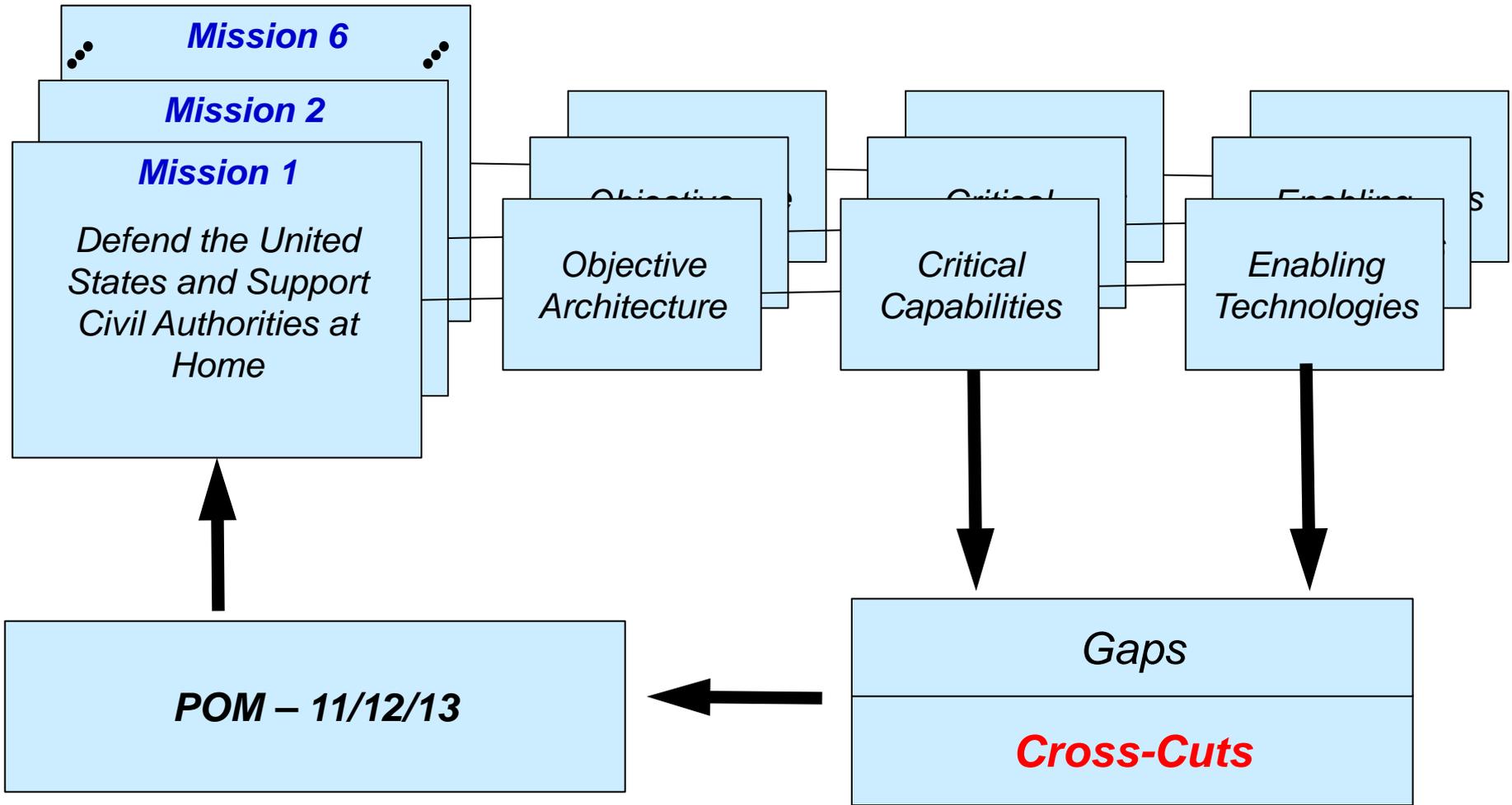


# Summary

- S&T investment matters to national security
- 2010 Quadrennial Defense Review Continued DoD on Non-Kinetic Path
- Need to Conduct Gap Analysis to Influence Funding Levels, Program Content



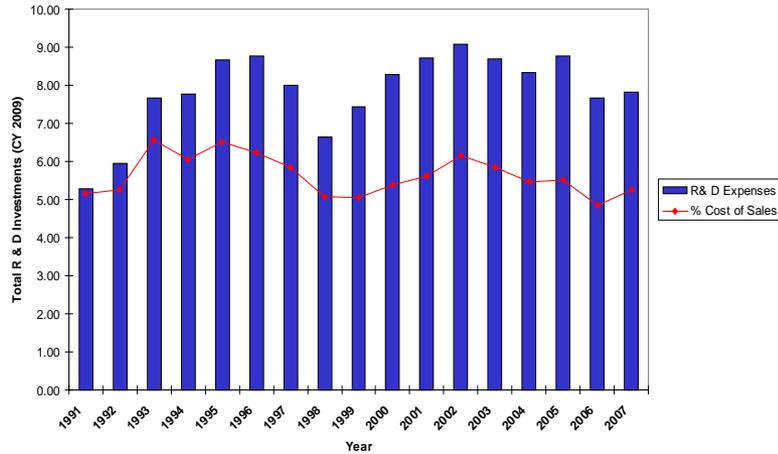
# QDR Mission Area Studies Approach



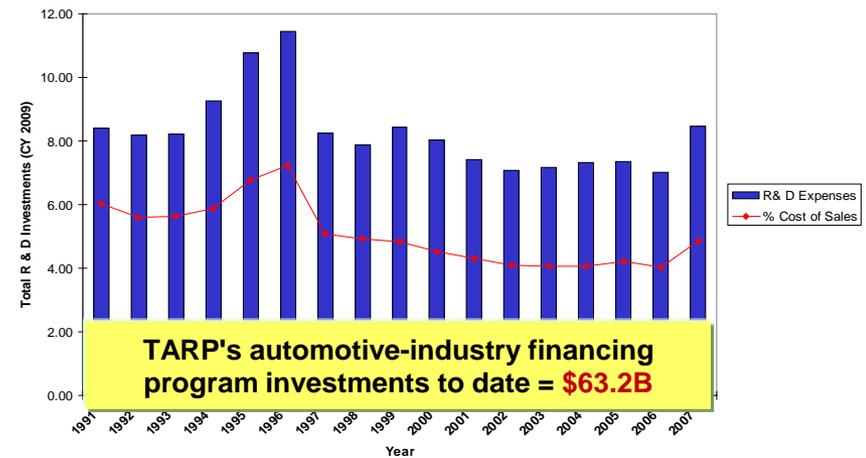


# Why S&T Matters – Industrial Experience

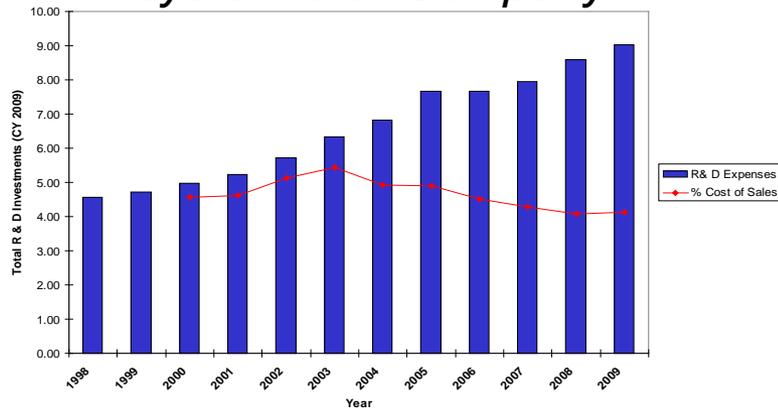
## Ford Motor Company



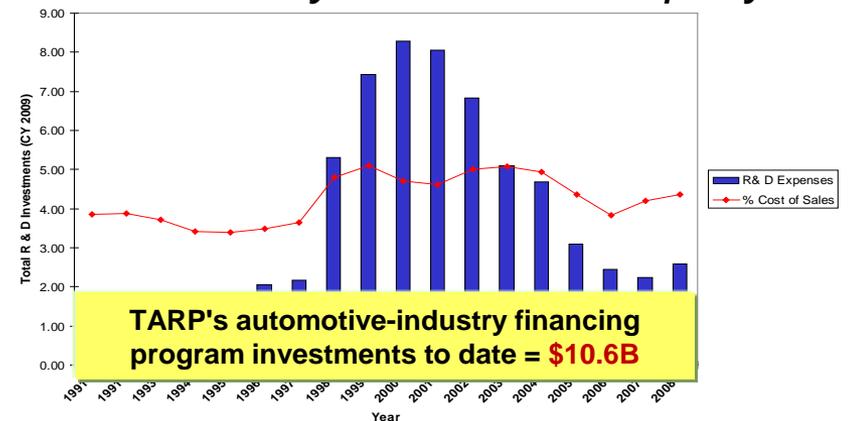
## General Motors



## Toyota Motor Company



## Daimler-Chrysler Motor Company

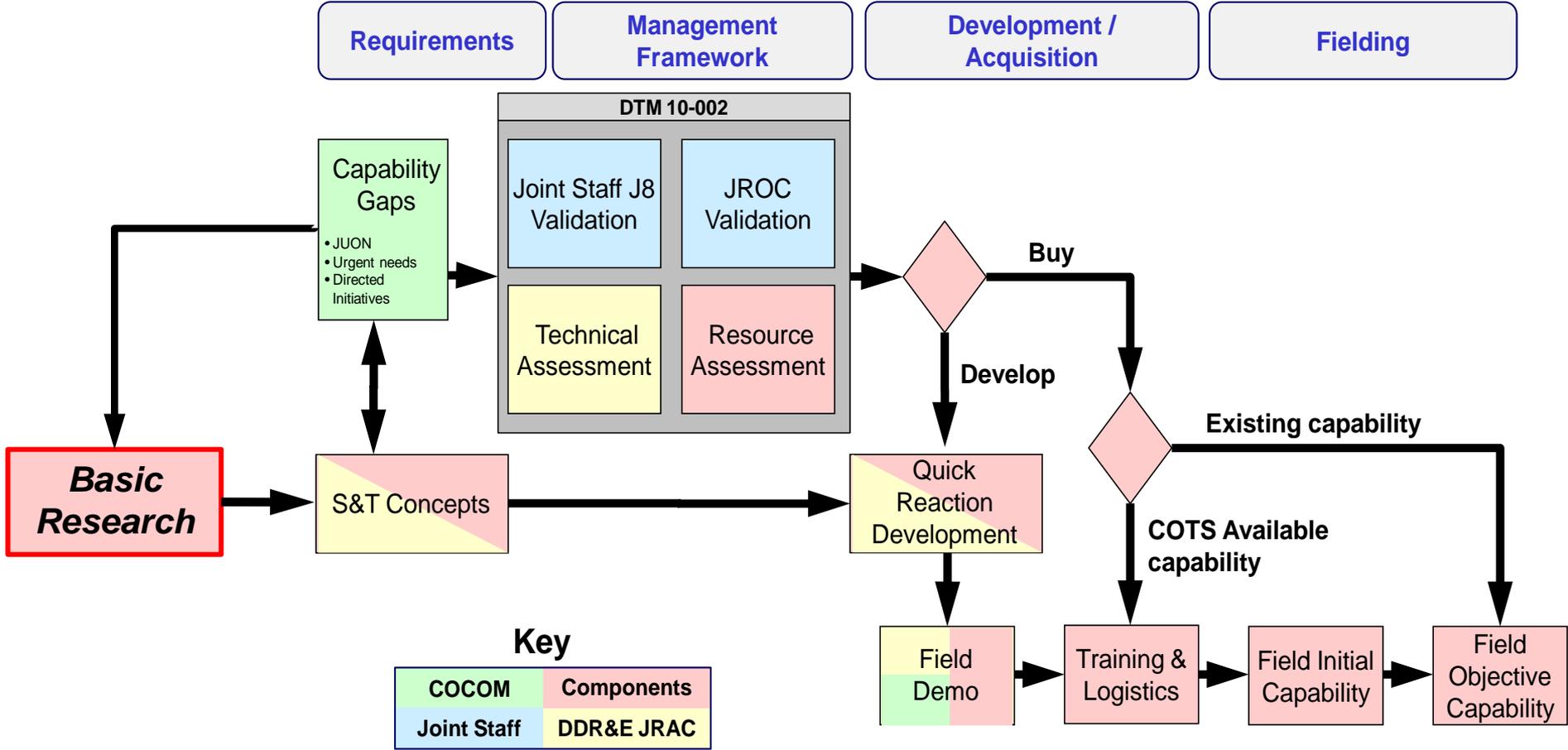


• **The Firm(s) That Have Not Maintained R&D Funding – Decline**

• **The Firm(s) That Have Slowly Increased R&D Funding - Healthy**

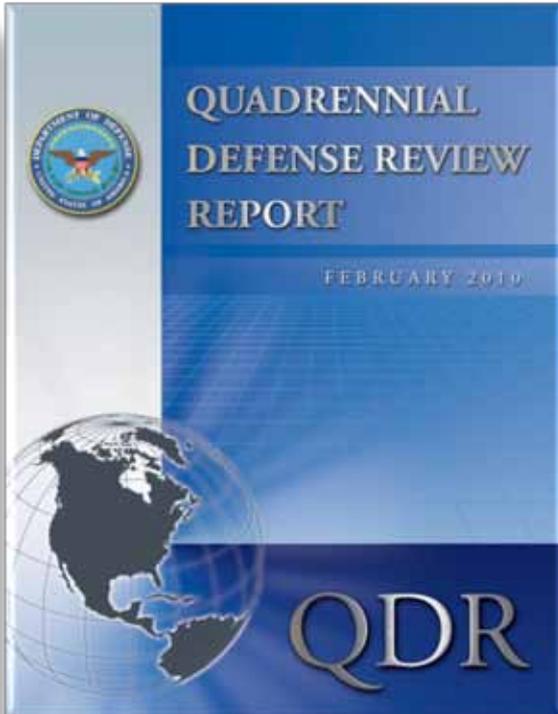


# Basic Research Feedstock for DoD Capabilities





# QDR Key Mission Areas and DPPG Tasking



Key Mission Area (KMA)		Team Lead
1	Defend U.S. and Support Civil Authorities at Home	<i>Mr. Tom Troyano</i>
2	Succeed in COIN/Stability/CT Ops	<i>Mr. Ben Riley</i>
3	Build Partner Security Capacity	<i>Mr. Elmer Roman</i>
4	Deter and Defeat Aggression in Anti-Access Environments	<i>Mr. Mike Olmstead</i>
5	Prevent Proliferation and Counter WMD	<i>Dr. Carol Kuntz</i>
6	Operate Effectively in Cyberspace	<i>Dr. Steve King</i>

***DPPG Task: “The DDR&E, with the support of the Secretaries of the Military Departments, Directors of the Defense Agencies, and CJCS will lead an effort across the Department to identify the core capabilities and enabling technologies for each of the six QDR key mission areas.”***

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# Each Team's Priority Enabling Technology Areas (ETAs)

ETA	KMA	1	2	3	4	5	6
Technologies especially important to developing a COP, decision making, and C2: information system technology		Green					
Technologies especially important to detect, track and identify specific potential threats: sensors, electronics and EW		Green					
Realistic, immersive irregular warfare (IW) training tools			Orange				
Geospatial understanding			Orange				
Immersive and mixed reality simulations (e.g., HSC dynamics)				Red			
Info sharing across multiple domains and security enclaves				Red			
Alternatives to GPS for providing position, nav, timing (PNT)					Blue-Gray		
Dynamic electromagnetic spectrum management					Blue-Gray		
Novel approaches for operationally significant CBRN standoff detection						Gray	
Threat specific analytical tools for probabilistic consequence prediction						Gray	
Distributed trust							Blue
Resilient architectures							Blue

**KMAs: 1 (HLD & SCA); 2 (COIN-Stab-CT); 3 (BSC); 4 (AA-AD); 5 (C-WMD); 6 (Cyber)**