



**Modeling and Simulation:  
*A Critical Component of  
DoD Science & Technology***

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**Deputy Under Secretary of Defense (Science & Technology)**

***June 2, 1999***

# DoD Science & Technology Mission

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**To ensure that the warfighters today and tomorrow have superior and affordable technology to support their missions, and to give them revolutionary war-winning capabilities**

# Revolutionary Capabilities

*Stealth*



*Adaptive Optics and Lasers*



*Night Vision*



**DoD S&T**

*GPS*



*Phased Array Radar*





# Role of DUSD (S&T)

**International  
Collaborations**

**Oversight/Assessment of  
DoD S&T Investment**

**Acquisition  
Software**

**DoD Modeling  
and Simulation**

**Office of Technology  
Transfer**

**High Performance  
Computing Program**

**Laboratory  
Management/Security**



# Changing Environments



## Security Threats

Rogue Nation States/Alliances

International Crime Organizations

Transnational Actors/Terrorists

Weapons of Mass Destruction

## 21st Century

- Conflict Increasing
- Proliferation of Military and Commercial Technologies
- Operations in Urban Environments
- Preponderance of Coalitions
- Ethnic Strife

## Impact

Greater Range of Solutions

No US Monopoly in all Technologies

Complex Targets/Terrain

Information Management Critical

# FY2000 Research, Development, Test & Engineering (RDT&E) Funding



**FY00 RDT&E = \$34.4B**  
(6.1 thru 6.7)

(\$B)  
36  
32  
28  
24  
20  
16  
12  
8  
4  
0

(6.6 + 6.7 = \$13.9B)

Development  
(6.4 + 6.5 = \$13.1B)

6.7 Operational Systems Development (\$11.5B)

6.6 RDT&E Management Support (\$2.4B)

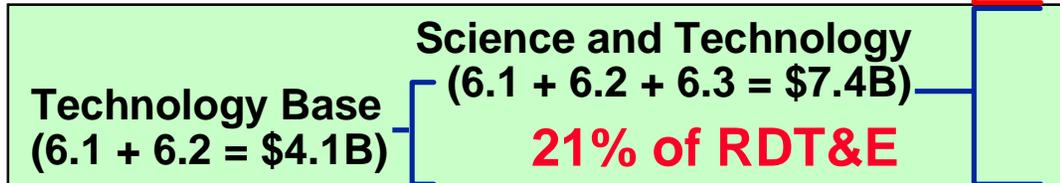
6.5 Engineering and Manufacturing Development (\$7.5B)

6.4 Demonstration and Validation (\$5.6B)

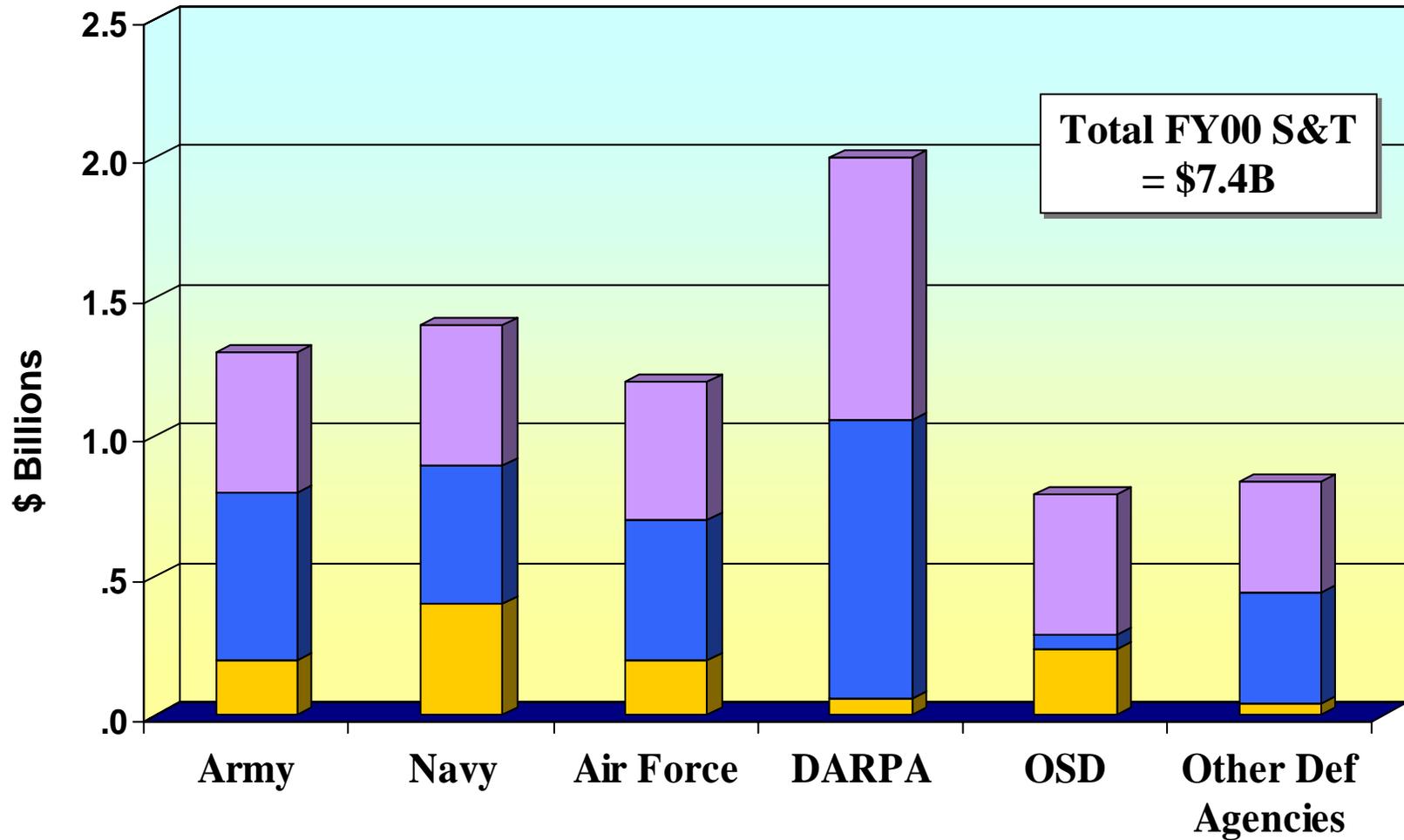
6.3 Advanced Technology Development (\$3.3B)

6.2 Applied Research (\$3.0B)

6.1 Basic Research (\$1.1B)



# DoD S&T Investment



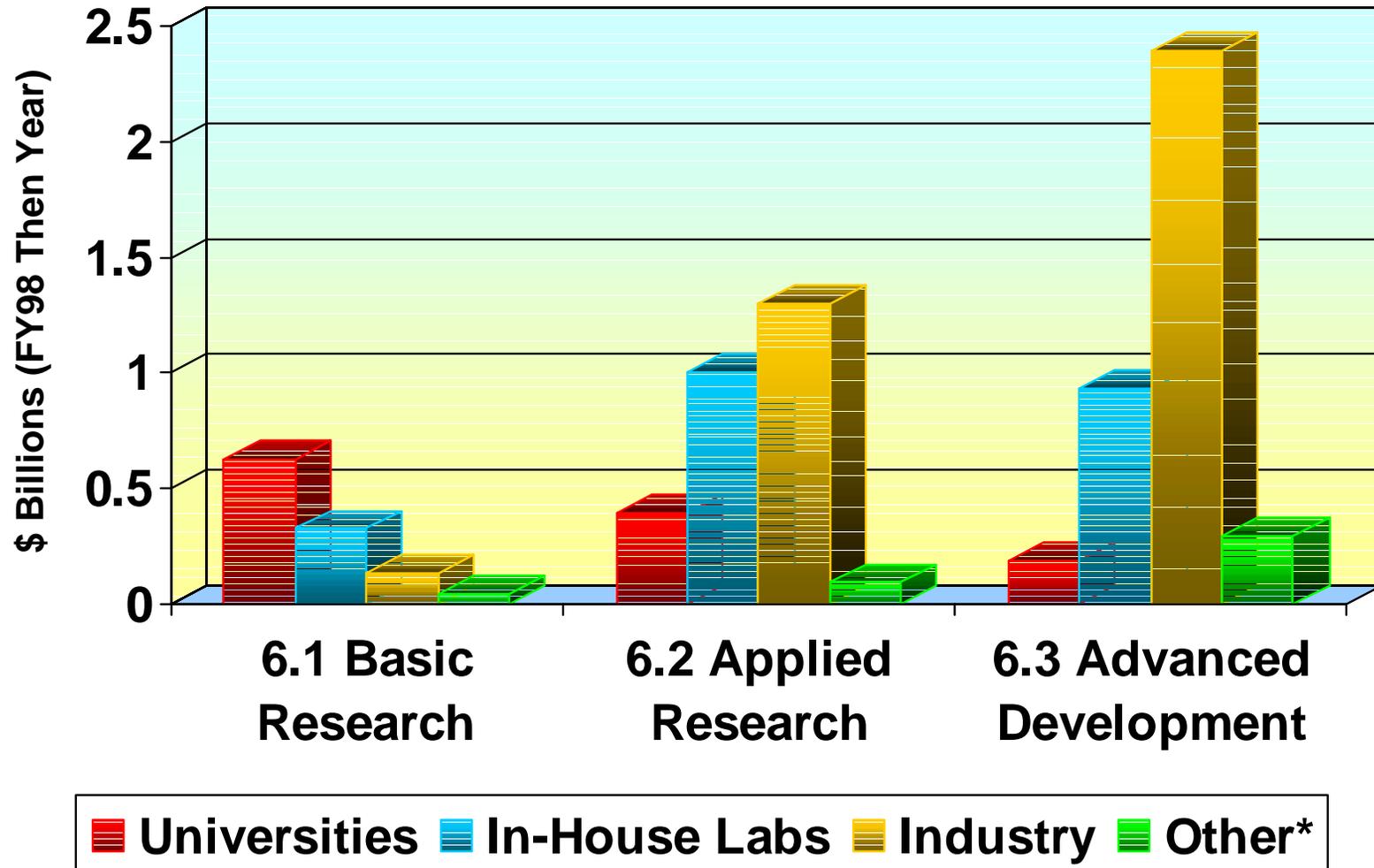
■ Basic Research (6.1)

■ Applied Research (6.2)

■ Adv Tech Dev (6.3)



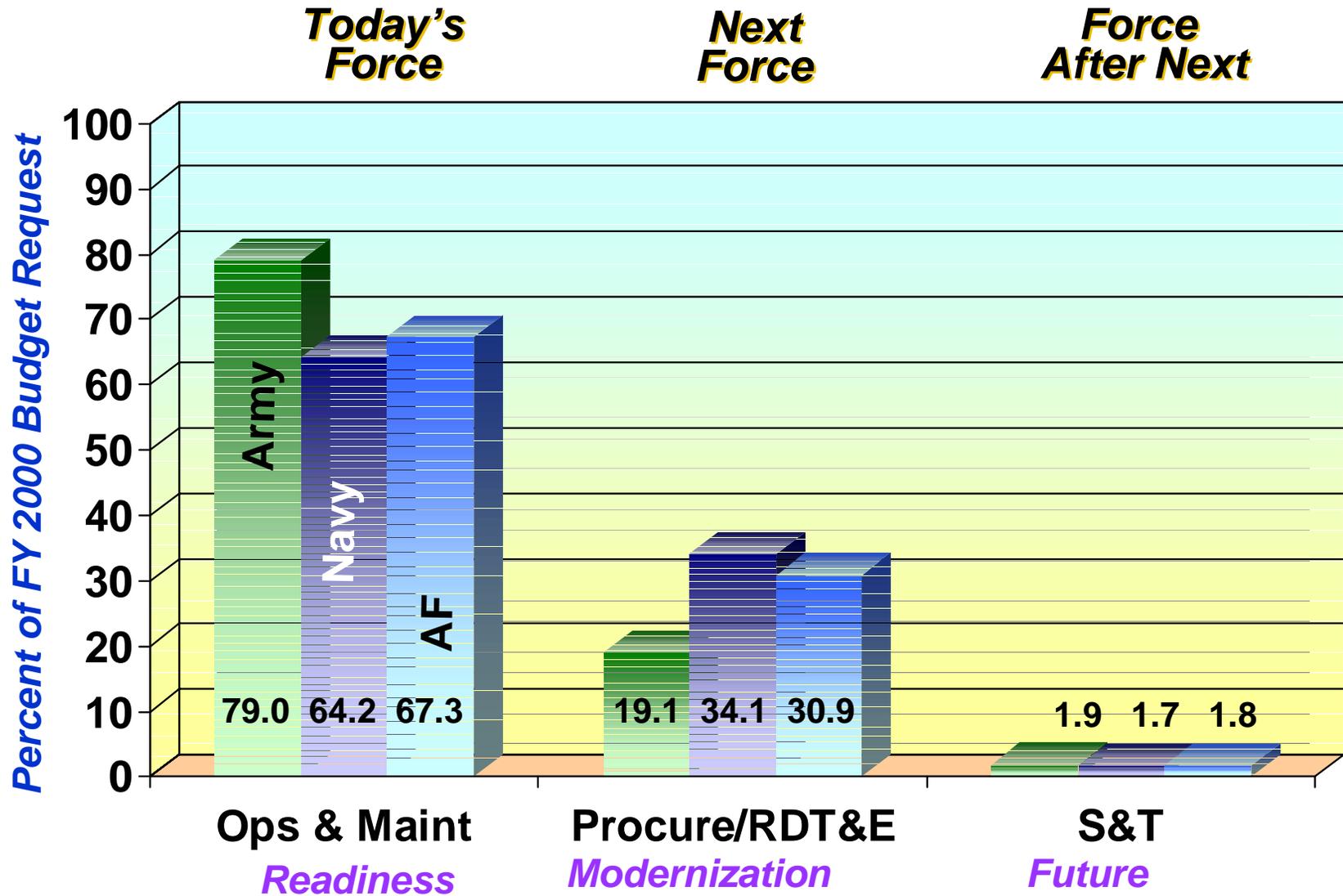
# Recipients of DoD S&T Funds



\*Includes non-profit institutions, State & local govt., & foreign institutions

Source: National Science Foundation Report, NSF 98-332 (FY 1998)

# DoD Investment Strategy



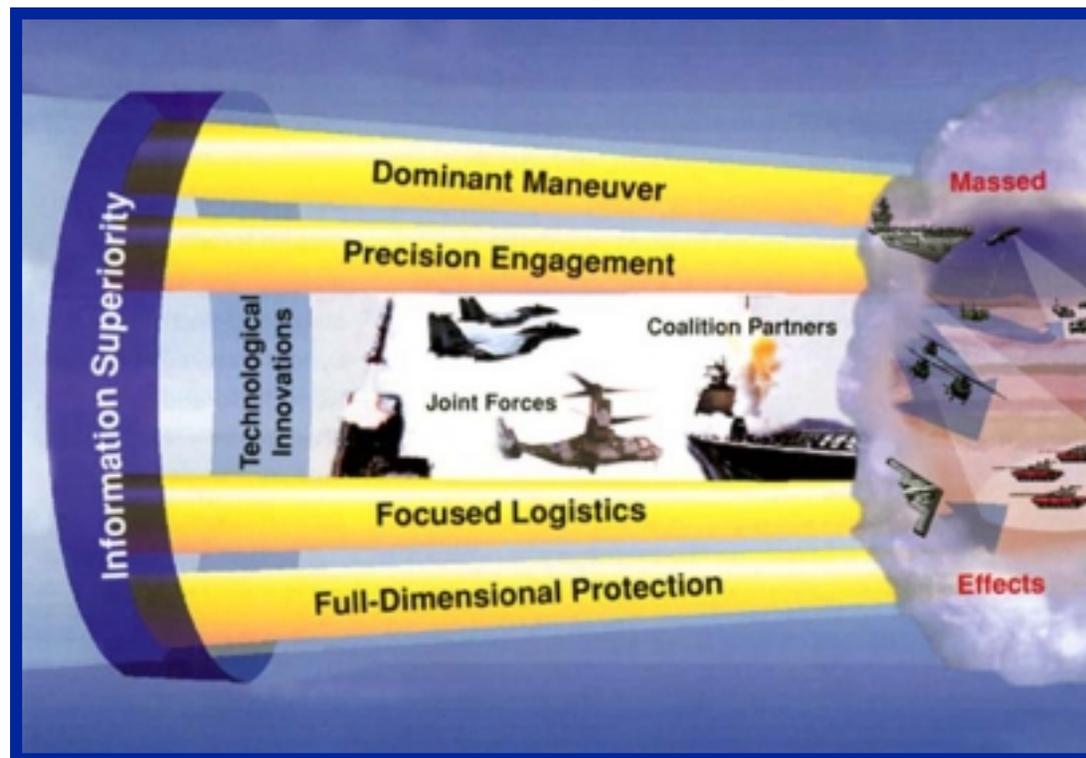
Note: AF does not include NRO & Special Ops

FY 2000 Dollars

# Joint Vision 2010

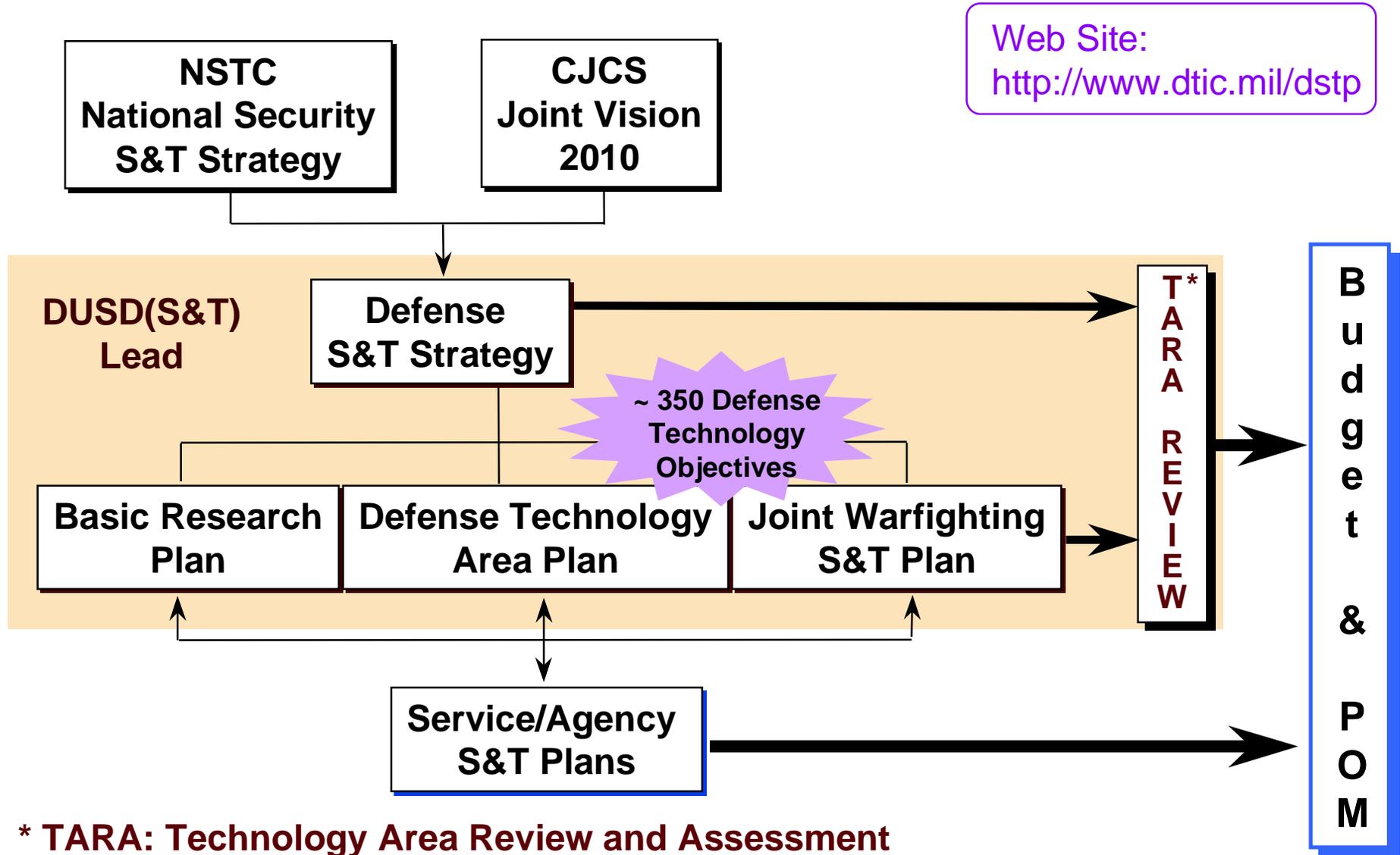


## Relies on Advancing Technology and Operational Warfighting Concepts



**The Lenses of Technological Innovation and Information Superiority Integrate and Amplify Four New Operational Concepts**

# Integrated Annual Defense S&T Planning Process



\* TARA: Technology Area Review and Assessment

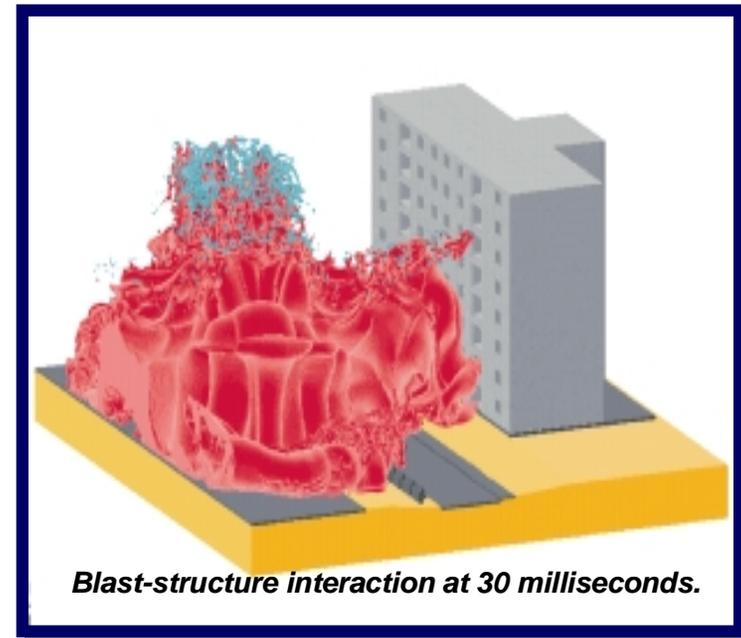
# Joint Warfighting S&T Plan (JWSTP)



- **JWSTP--Focus to blend emerging technology into warfighter needs**



**Damaged Barracks in Saudi Arabia**



**Simulation of a terrorist explosion against a multistory building**

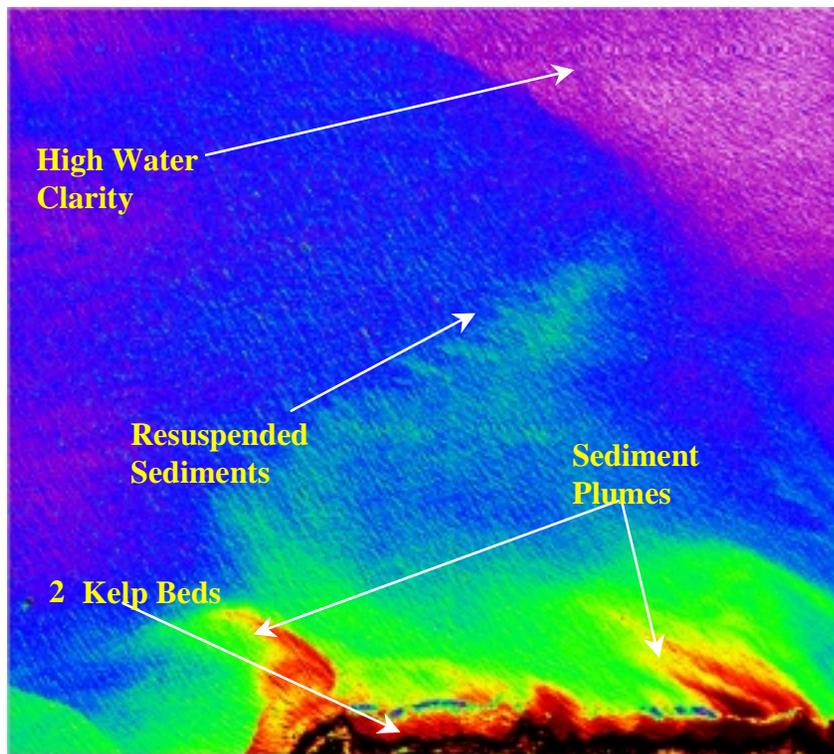
**Example:** *DTO L.06 Structural Blast Mitigation*

**Objective:** *Develop techniques to mitigate shock and blast damage in structures.*

# Defense Technology Area Plan (DTAP)



- DTAP--A detailed plan focusing DoD science on militarily significant technologies in specific functional areas



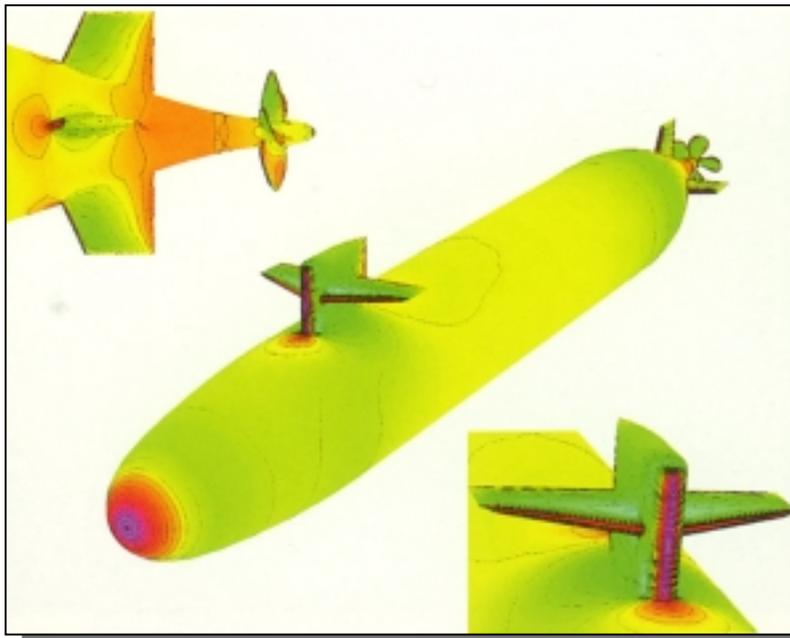
*An agreement  
between  
the S&T  
Community  
and Acquisition  
Customers*

**Example: DTO SE.67 Hyperspectral Technologies**

# Basic Research Plan (BRP)



**BRP--A strategic plan to link longer term research to broad, revolutionary warfighter capabilities**



*Computer-generated, color-coded pressure distributions around fully appended submarines.*

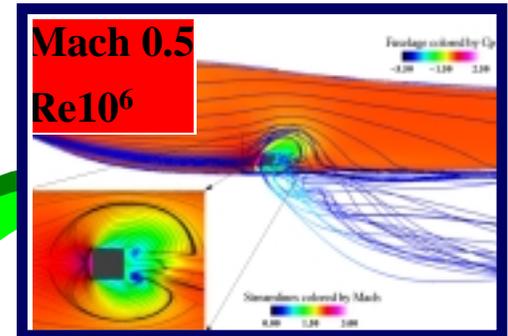
*A Strategic plan guiding new scientific research.*

**Improved submarine designs without costly model construction**

# Defense Technology Plan (DTAP) M&S Technology Focus



**IS.40 Individual Combat  
& Small unit Ops Simulation**



**IS.11 Simulation  
Information Technologies**

**IS.12 Simulation  
Representation**



**M&S Applications  
(Analysis, Acquisition,  
& Training)**

**IS.10 Simulation  
Interconnection**





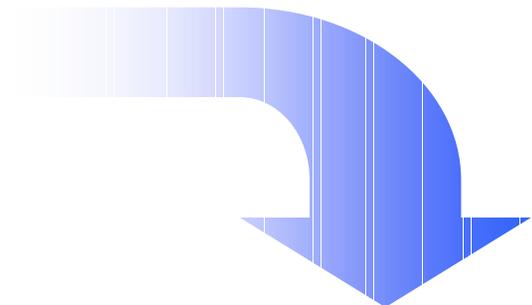
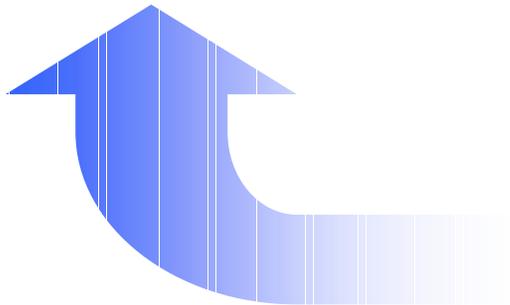
# S&T Emphasis Areas

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- Chemical & Biological Defense
- Hardened and Deeply Buried Targets
  - Smart Sensor Web
  - Cognitive Readiness
  - Information Assurance

## *S&T Integration*

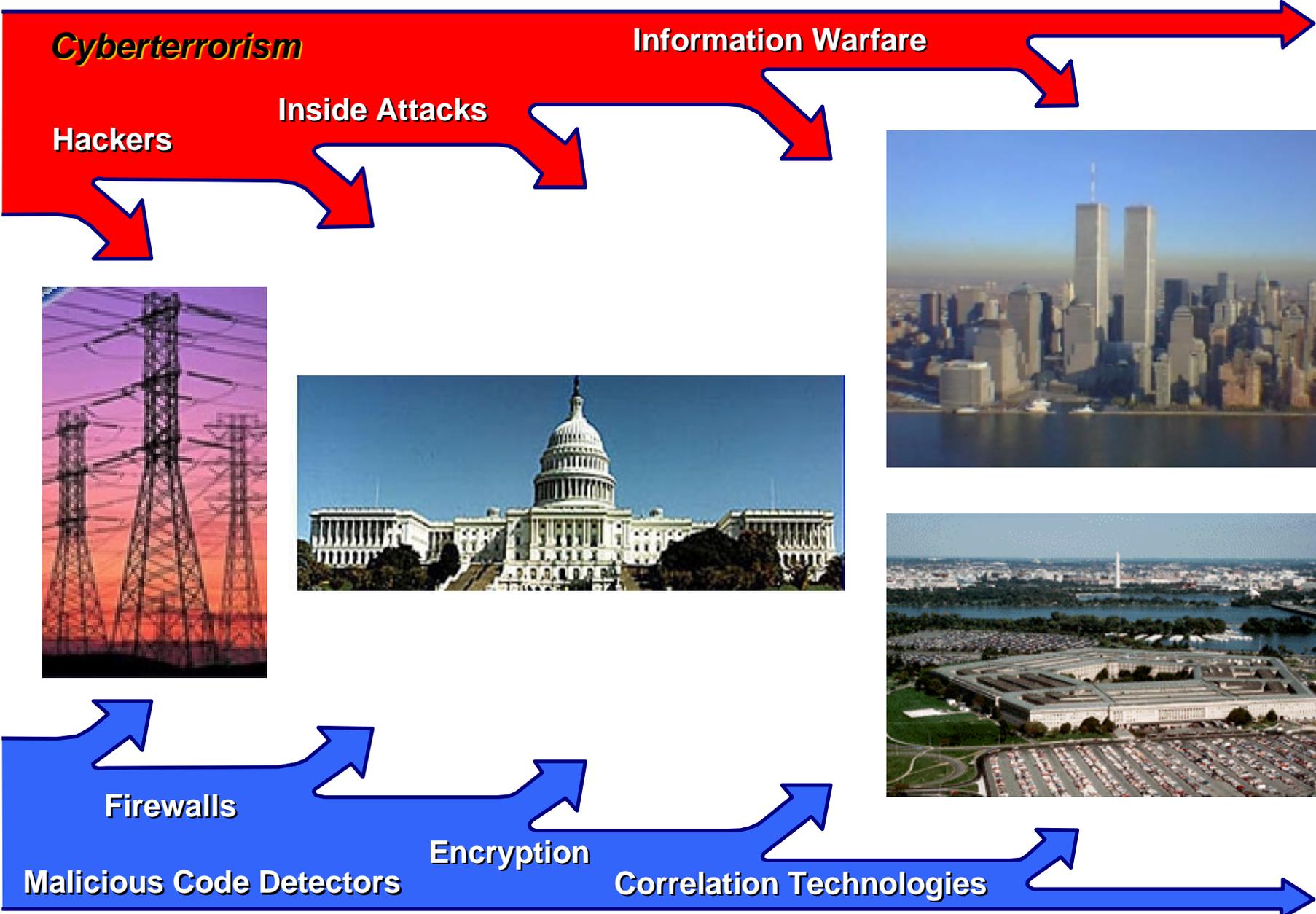
- HPCMP
- DMSO



# Chemical & Biological Defense



# Information Assurance



**Cyberterrorism**

**Information Warfare**

**Hackers**

**Inside Attacks**



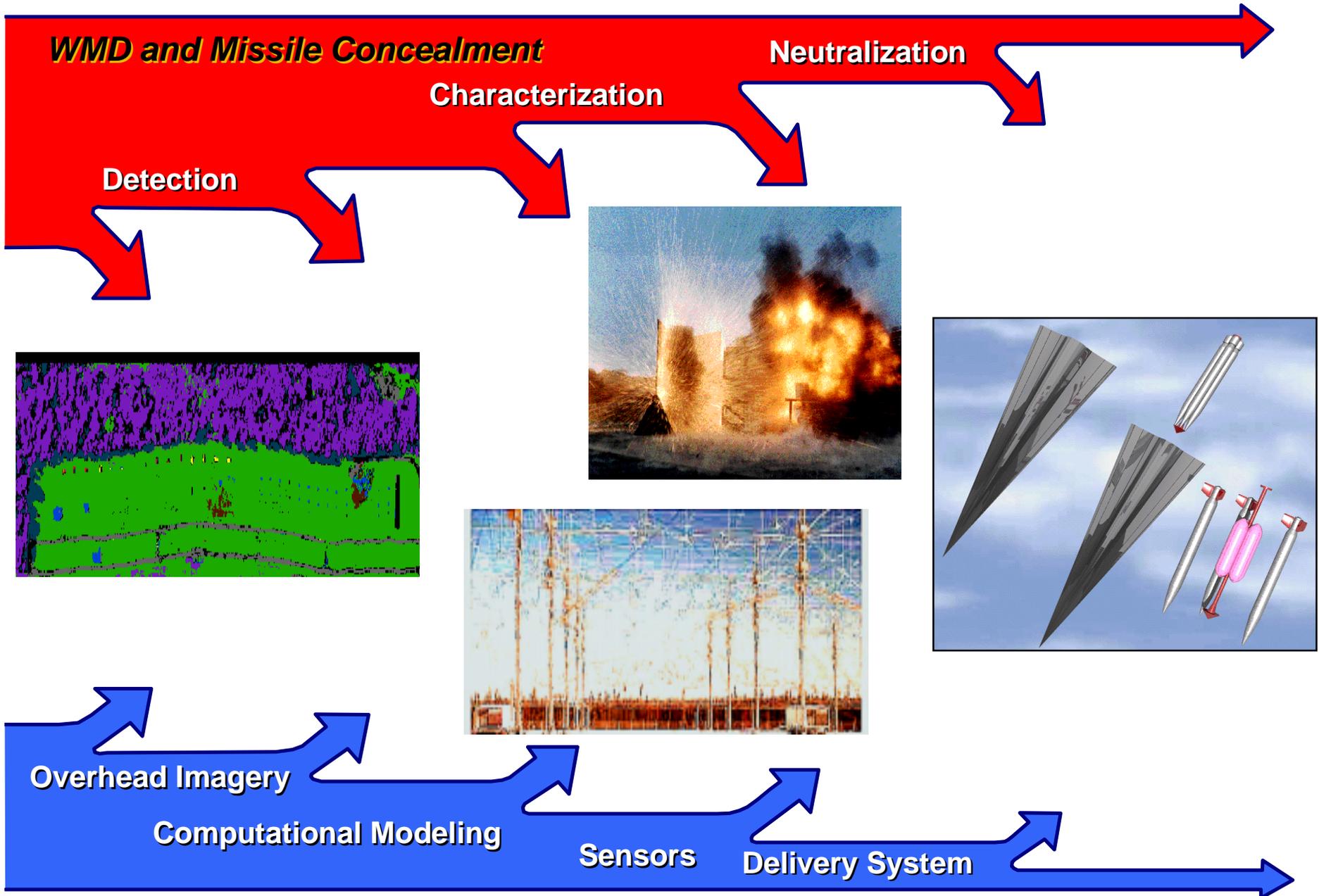
**Firewalls**

**Malicious Code Detectors**

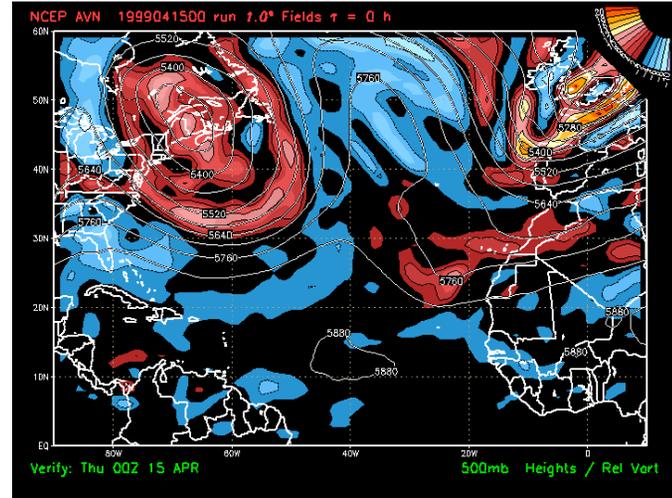
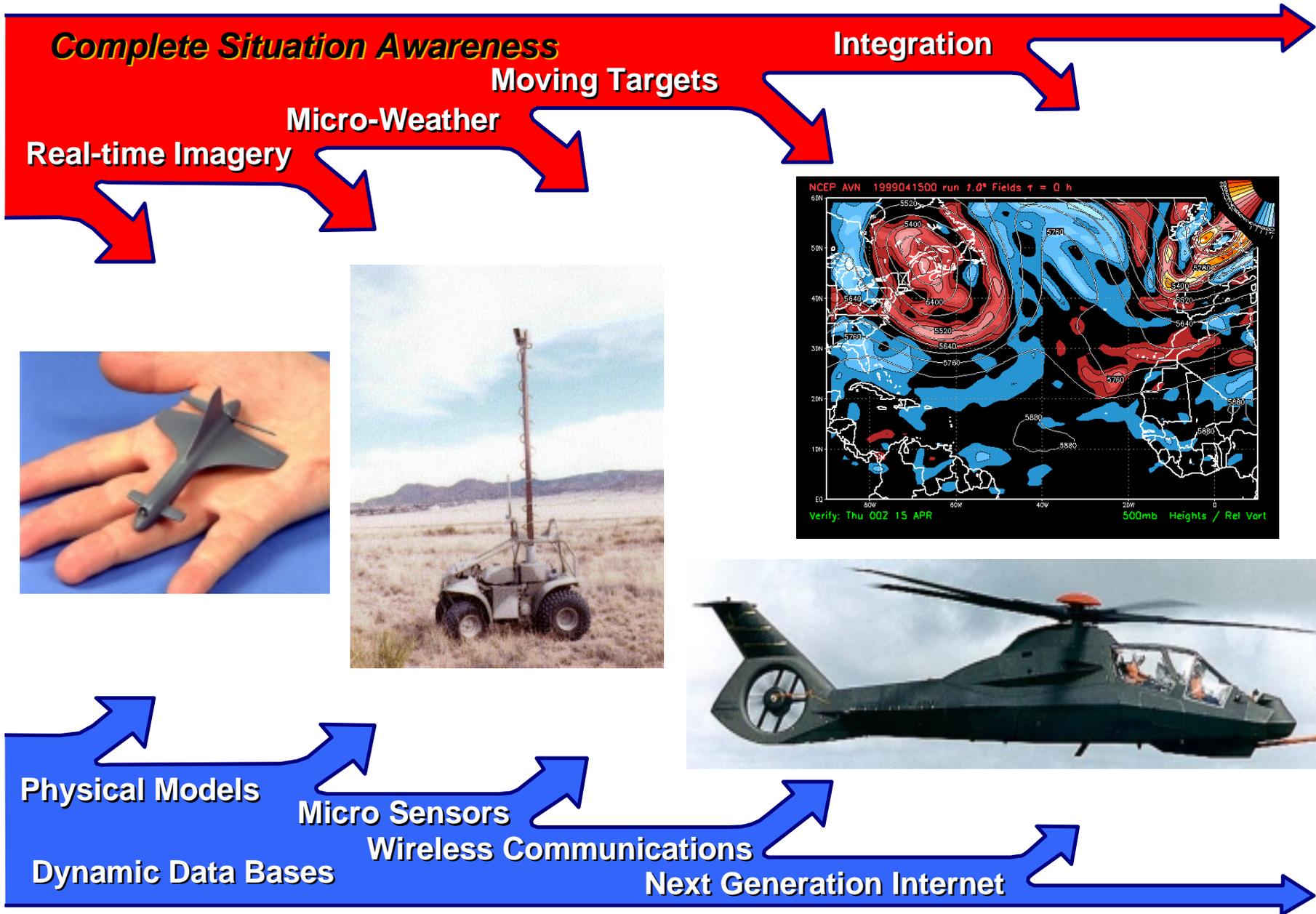
**Encryption**

**Correlation Technologies**

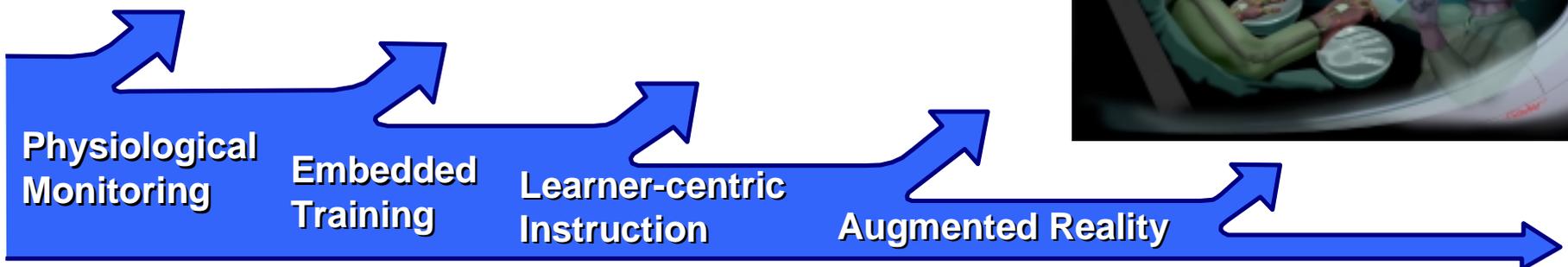
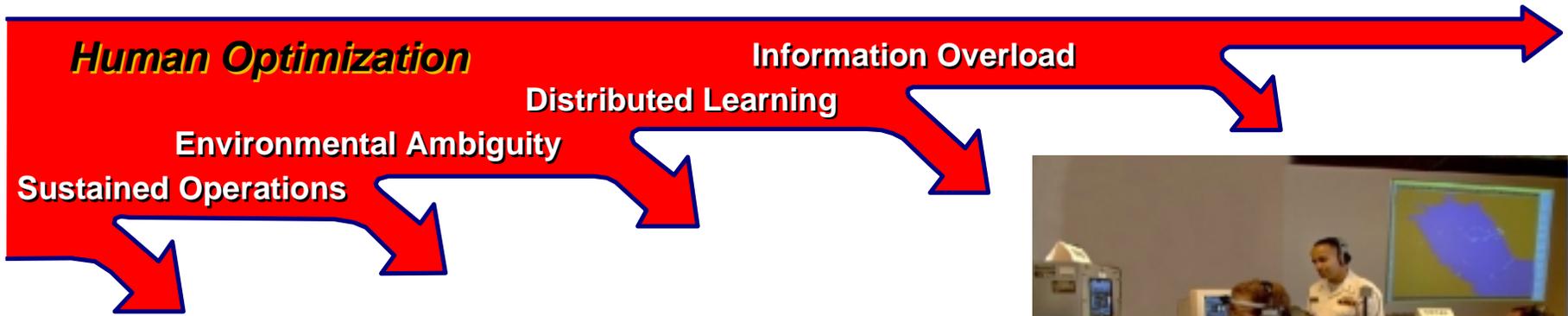
# Hardened and Deeply Buried Targets



# Smart Sensor Web



# Cognitive Readiness



# High Performance Computing Modernization Program

**Mission: Provide world-class HPC capability to the DoD science and technology and developmental test and evaluation communities**

## HPCMP Resource Centers

MSRCS

### Major Shared Resource Centers

- Networked very large computer centers
- Top 30 facilities in speed and storage



### Distributed Centers

- Complements MSRCs
- Supports local missions (real-time processing)

DCS

## CHSSI

CSM



CFD



CCM



CEA



FWO



**Common HPC Software Support Initiative**

- Provides multi-purpose codes that perform on a range of HPC platforms,
- Develops critical DoD software that can execute in a scalable computing environment

## PET

### Programming Environment and Training

- Full-spectrum HPC technology transfer program
- Partners: Top academic institutions (NCSA, SDSC, 20+ academic institutions)



SIP



FMS



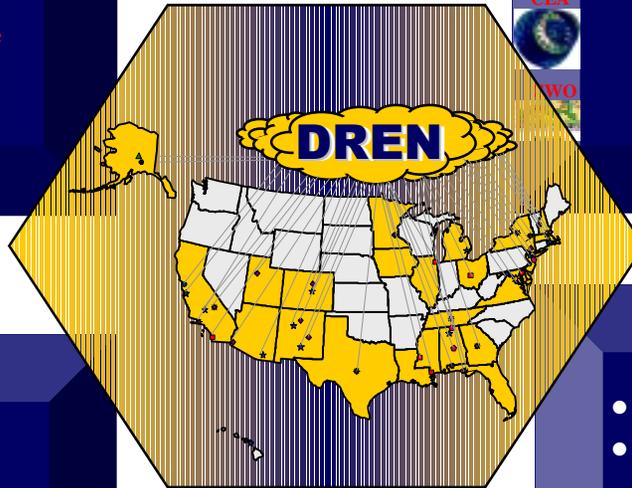
EQM



CEN



IMT

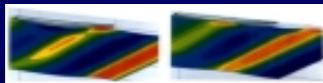


## DoD Challenge Projects

DoD Challenge Projects: competitively selected as pathfinding applications addressing mission-critical requirements.

- 28 Challenge Projects selected for FY99

16 continuing projects  
12 new projects



- Provides high-performance, high-bandwidth DS3 through OC3 (OC12 in the future) WAN services.
- Uses a commercial service contract.
- Provides services tailored to the requirements of a site anywhere in the 50 states.

## Requirements Analysis

- Questionnaire:
- Interviews: Service Validation: Ensures that only approved and funded projects are included
- Requirements Analysis Database:

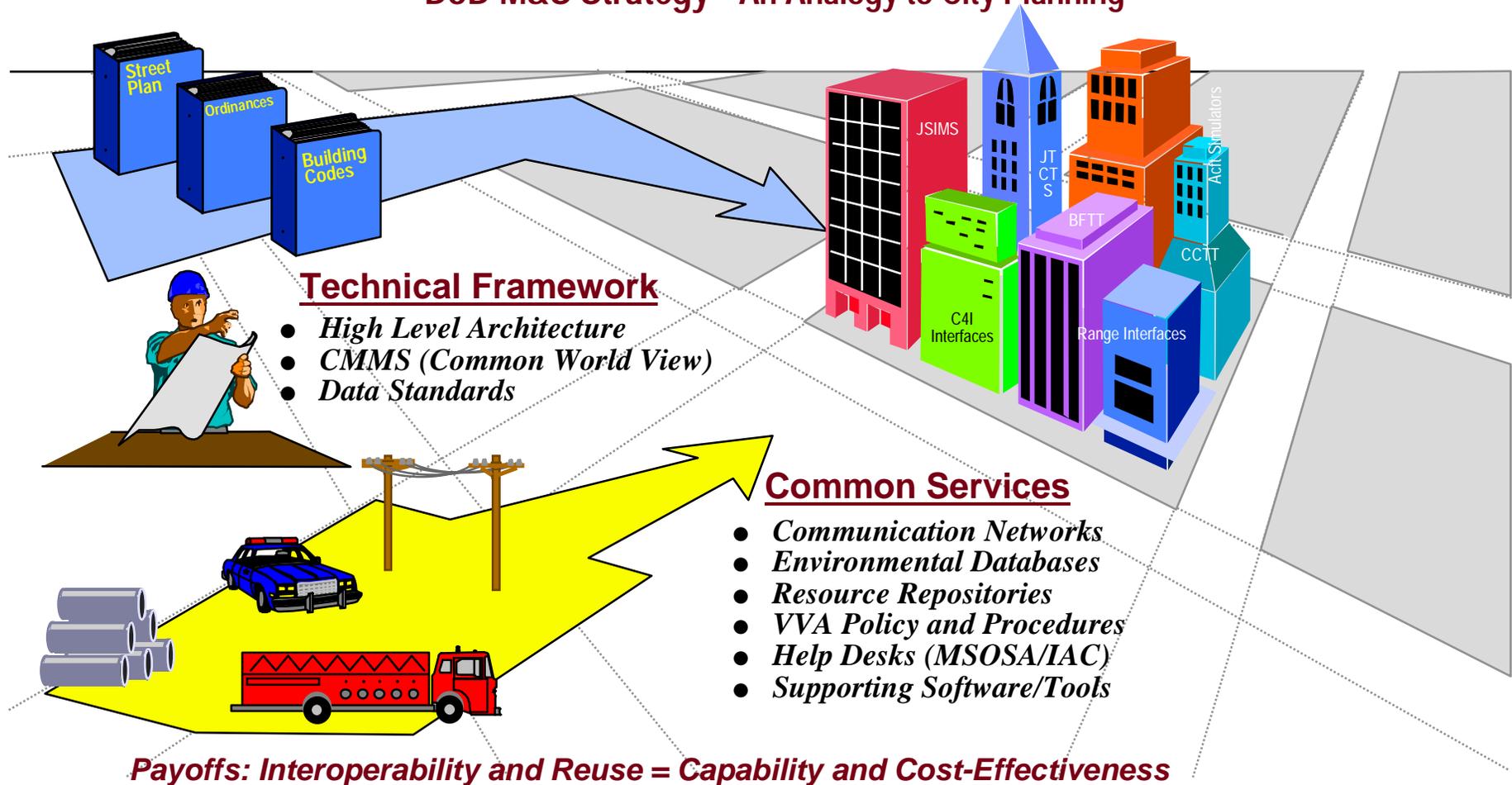
## Resource Allocation

- Goal:
- Approximately 80% allocated by individual Services and Agencies
- Approximately 20% allocated to DoD Challenge Projects



# Defense Modeling and Simulation

## DoD M&S Strategy—An Analogy to City Planning



# High Level Support

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**“... simulation and modeling can help us ... by reducing the risk ... saving time ... and by making efficient use of scarce and increasingly expensive resources.” \***

**Dr. Jacques S. Gansler**  
**Under Secretary of Defense**  
**for Acquisition and Technology**

\* Remarks at the May 19, 1998, Precision Strike Association Annual Program Review, Ft Belvoir, Virginia

# Corporate Functions of DMSO

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- **M&S Standards Development**
- **M&S Education & Training**
- **Interaction with Joint M&S Programs**
- **Leadership of New M&S Initiatives**
- **Strategic Thrusts with M&S Community**



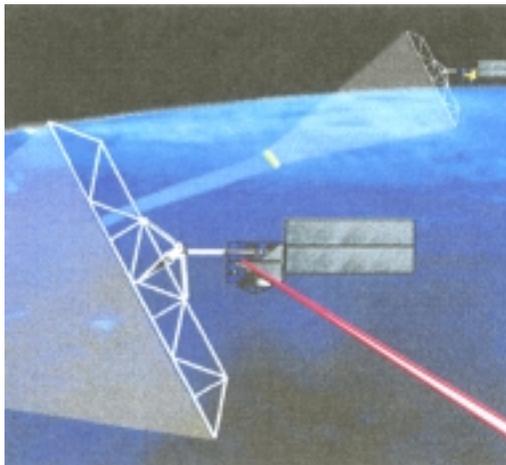
# DoD S&T is a Partnership

**Stable, Long Term Investment**



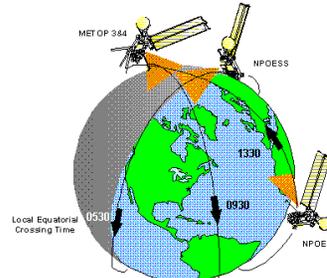
*Service Labs*

**DARPA**



**High Risk, High Payoff**

**Expanded Resource Base**



*Interagency*

**New Ideas, Knowledge**



*Universities*

**Industries**



**Innovation, Transition**

**Maximum National Security Payoff**

*International*



**Coalition Capability**