



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

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DoD Science & Technology Mission



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)

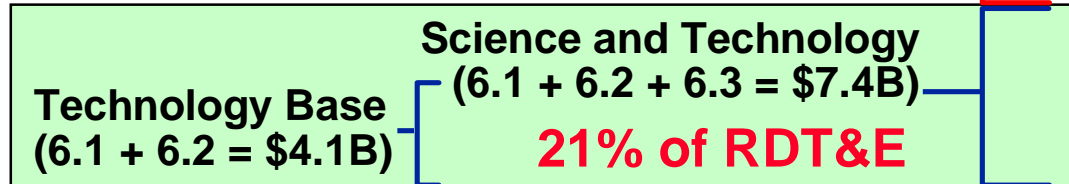
6.2 Applied Research (\$3.0B)

6.1 Basic Research (\$1.1B)

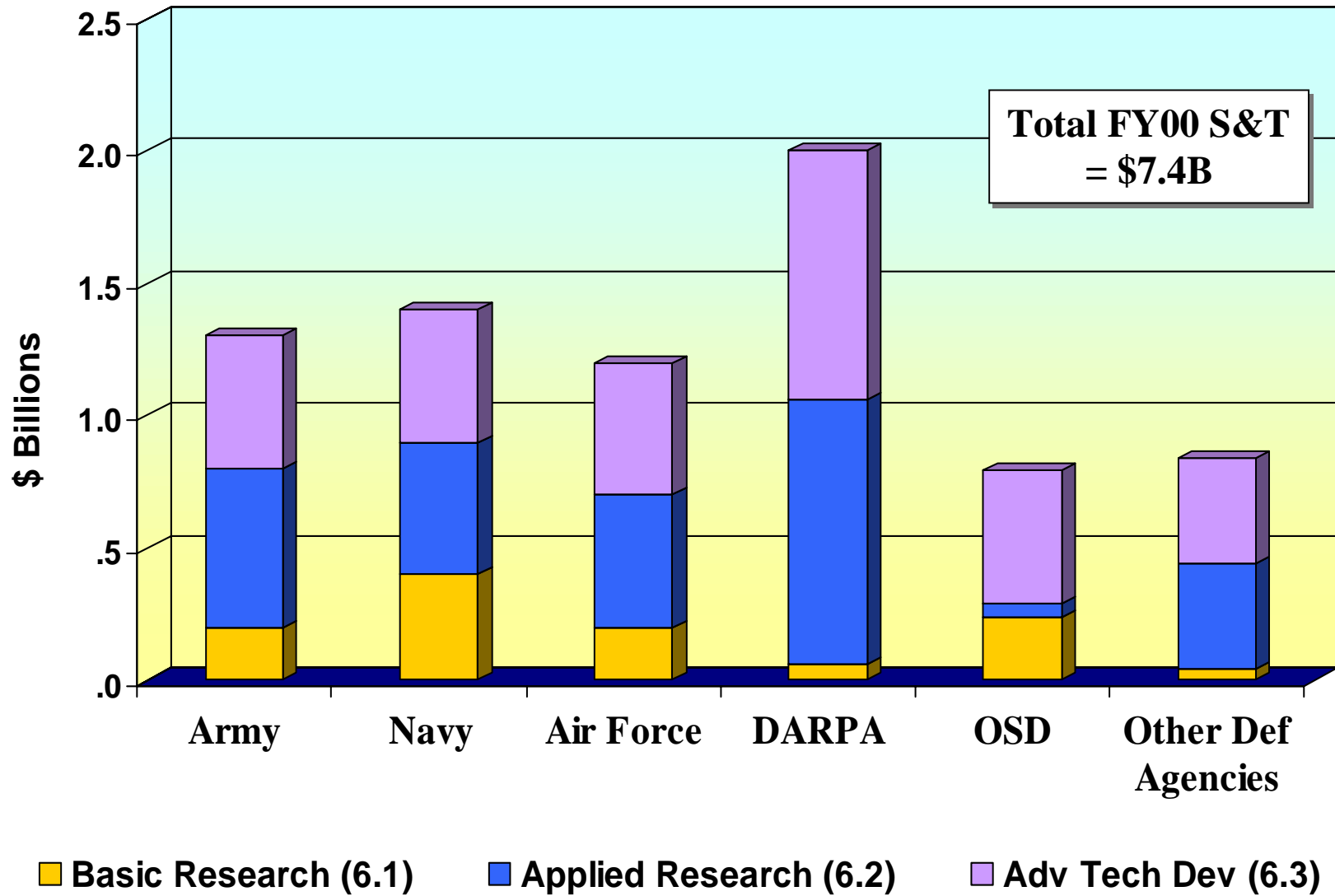
Science and Technology
(6.1 + 6.2 + 6.3 = \$7.4B)

Technology Base
(6.1 + 6.2 = \$4.1B)

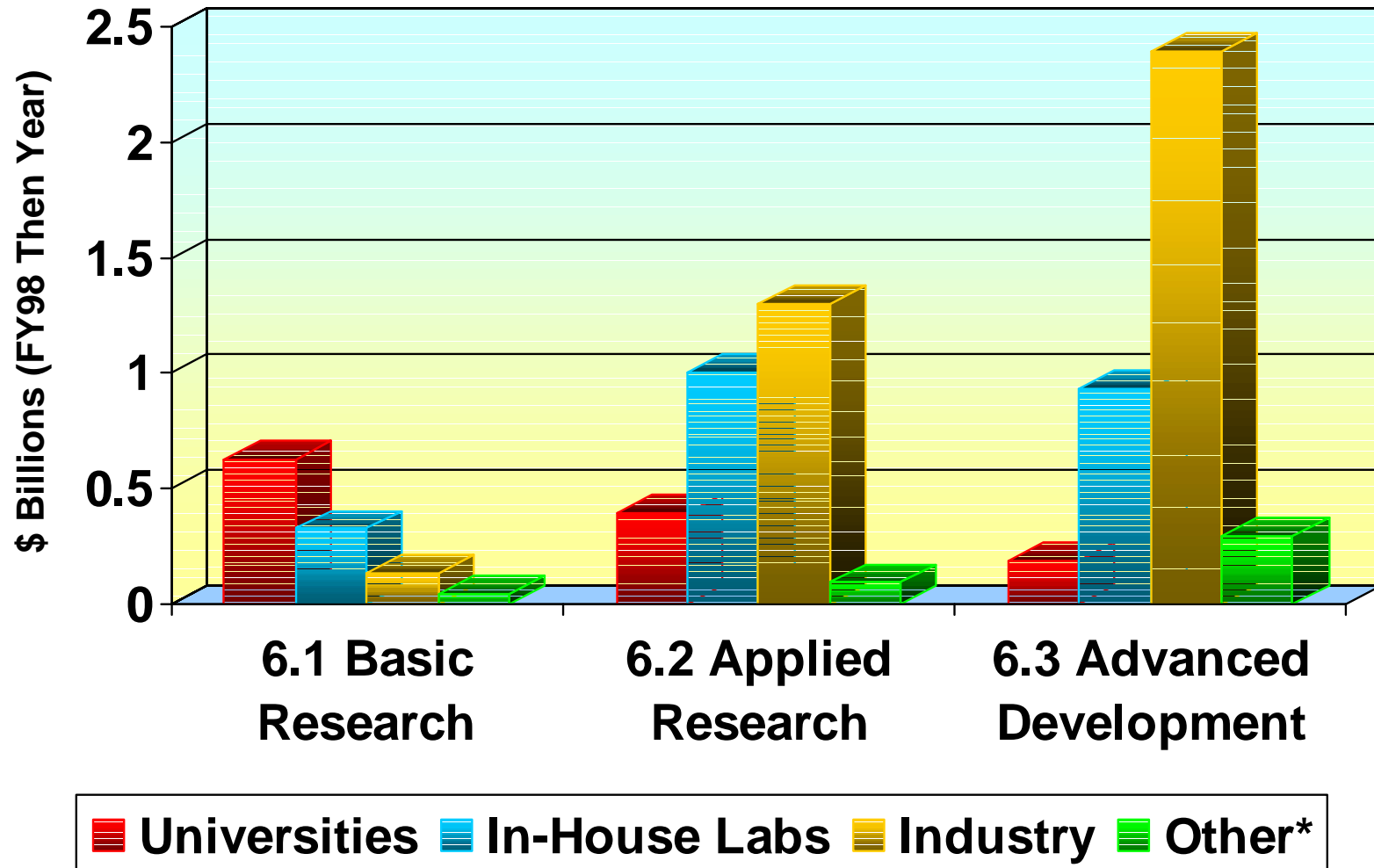
21% of RDT&E



DoD S&T Investment



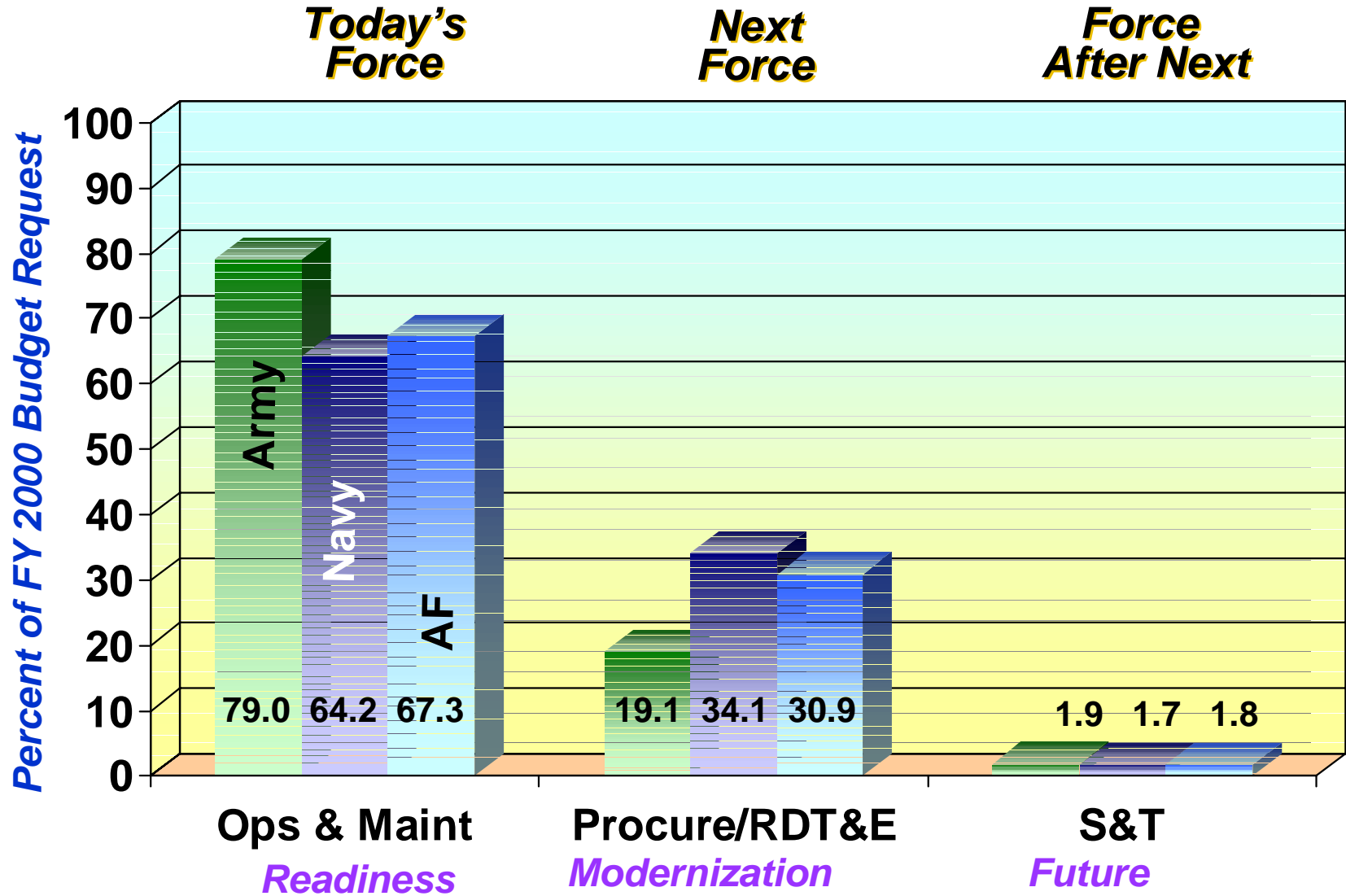
Recipients of DoD S&T Funds



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

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

DoD Investment Strategy



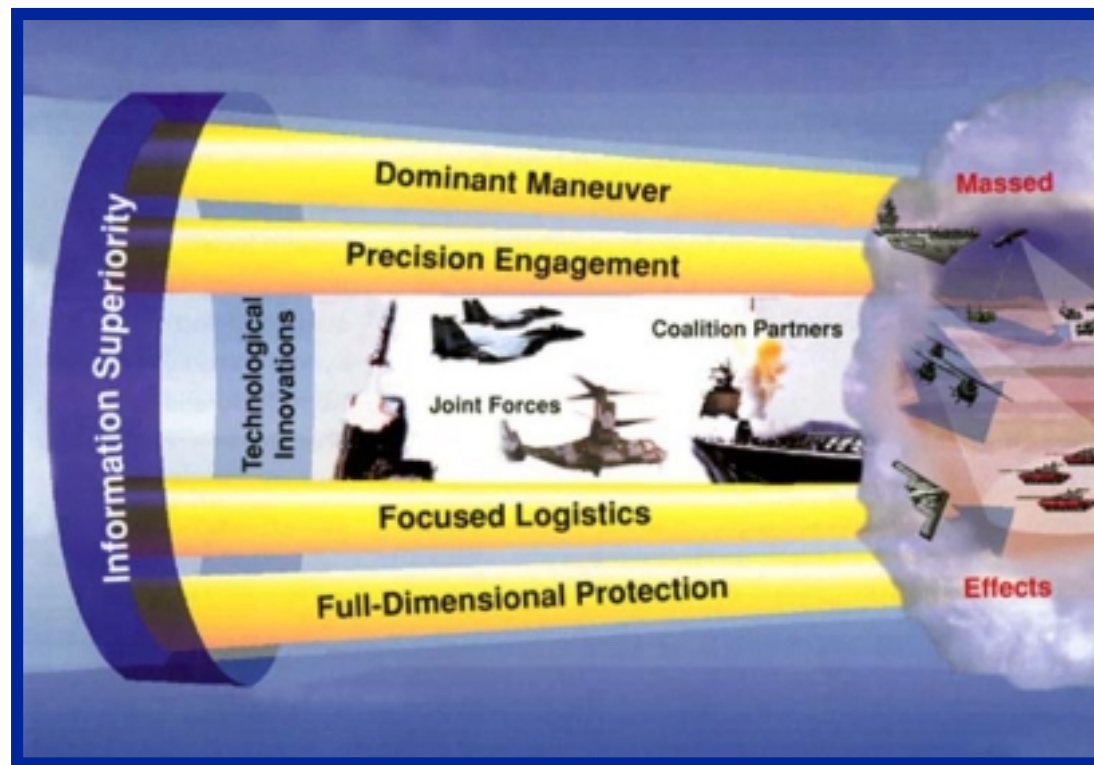
Note: AF does not include NRO & Special Ops

FY 2000 Dollars

Joint Vision 2010

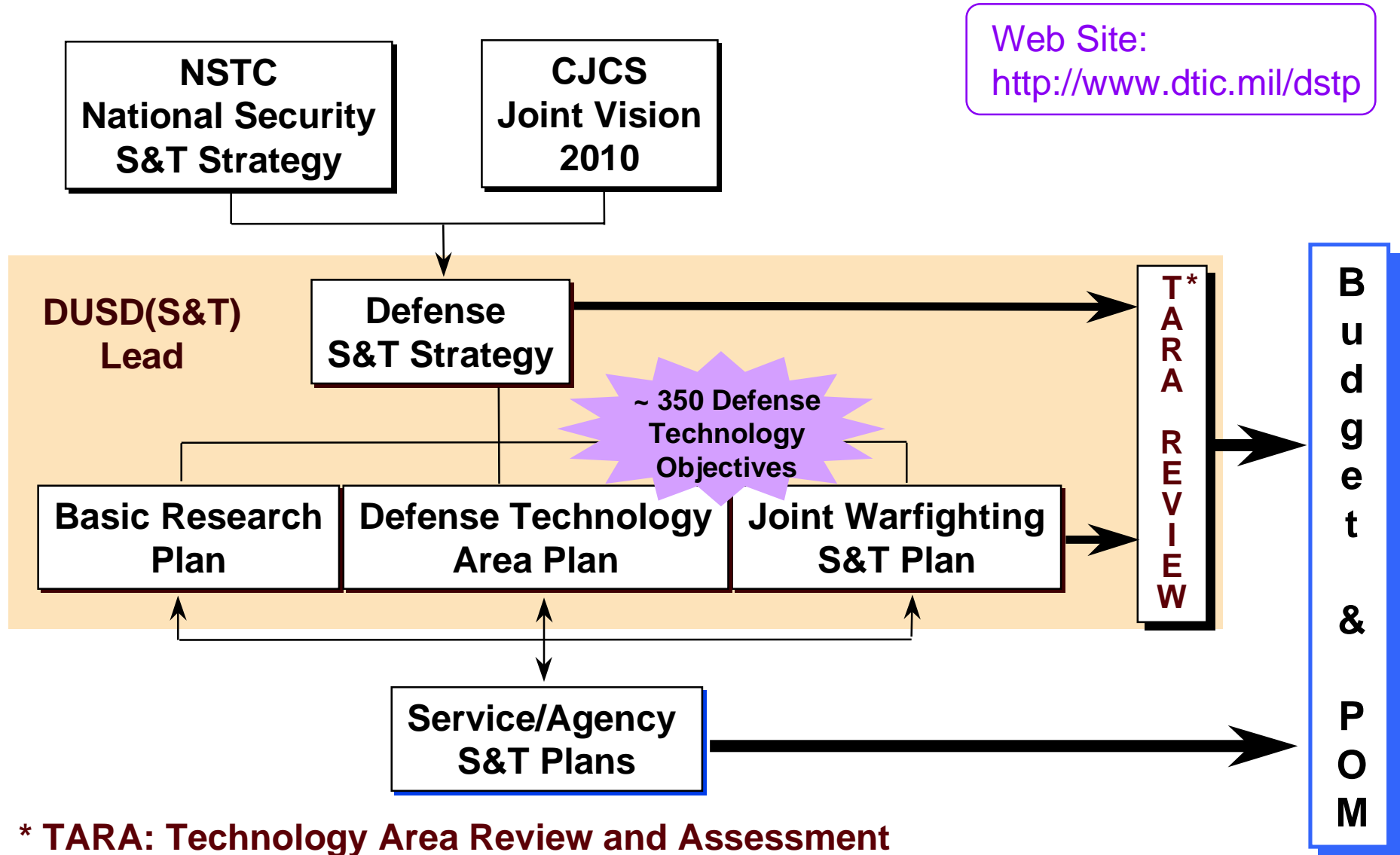


Relies on Advancing Technology and Operational Warfighting Concepts



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

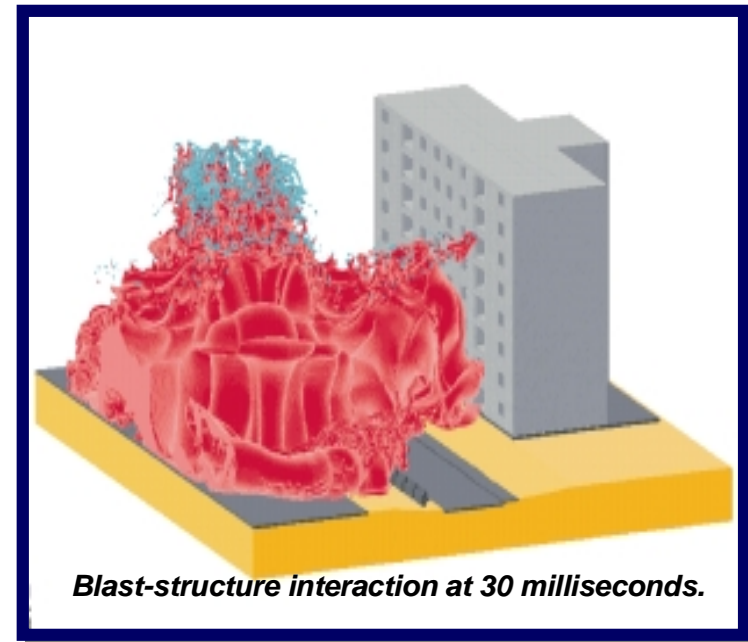
Joint Warfighting S&T Plan (JWSTP)



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



Damaged Barracks in Saudi Arabia



Simulation of a terrorist explosion against a multistory building

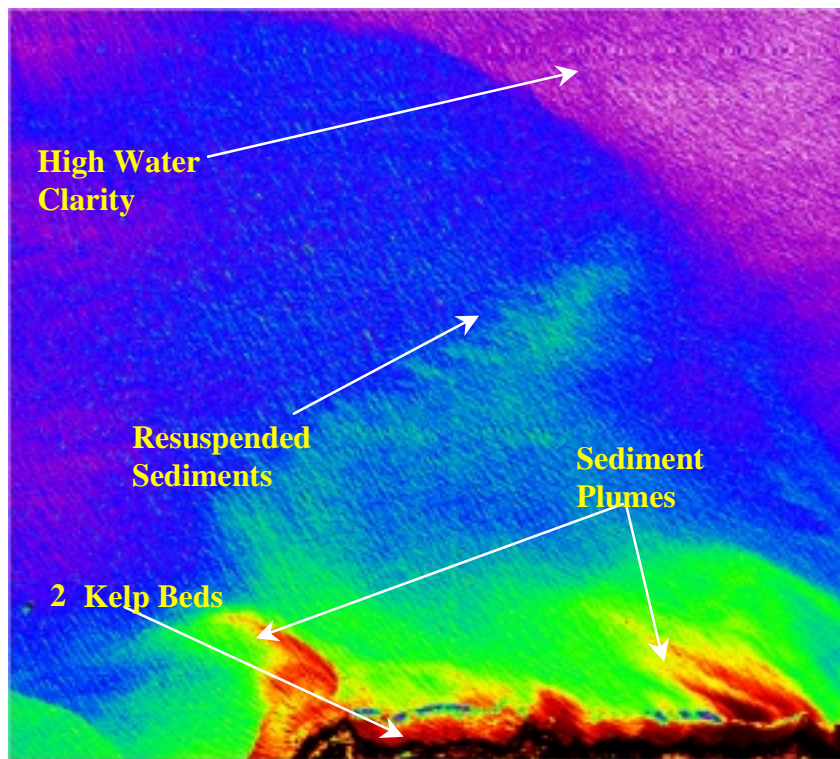
Example: *DTO L.06 Structural Blast Mitigation*

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



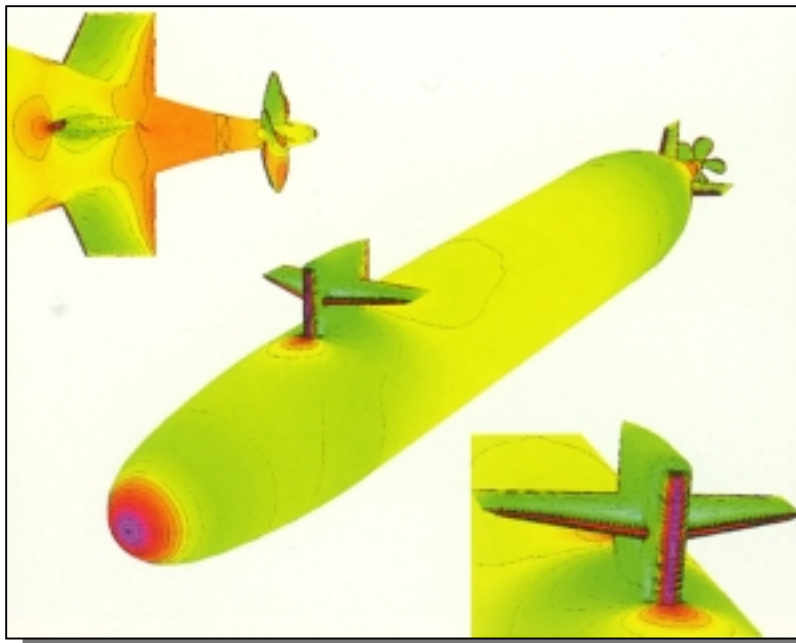
*An agreement
between
the S&T
Community
and Acquisition
Customers*

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.

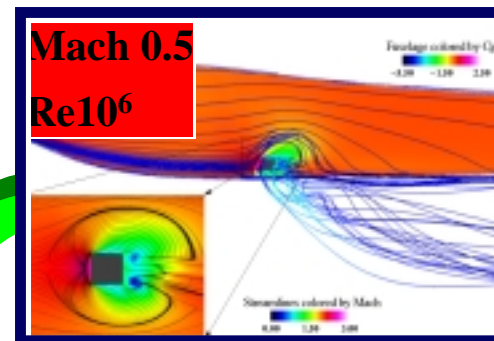
A Strategic plan guiding new scientific research.

Improved submarine designs without costly model construction

Defense Technology Plan (DTAP) M&S Technology Focus



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



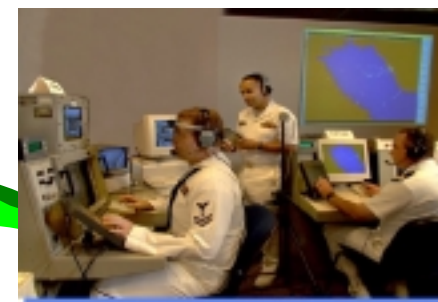
**IS.11 Simulation
Information Technologies**

**IS.12 Simulation
Representation**



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

**IS.10 Simulation
Interconnection**



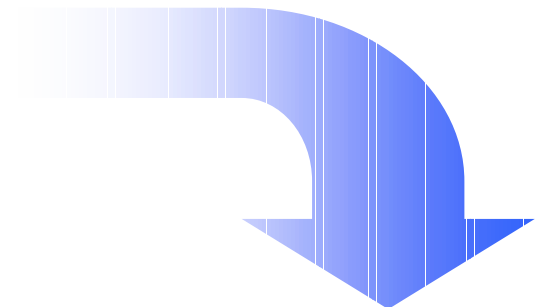


S&T Emphasis Areas

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

S&T Integration

- HPCMP
- DMSO



Chemical & Biological Defense

Inexpensive Weapon Proliferation

Biological Agent

Chemical Agent



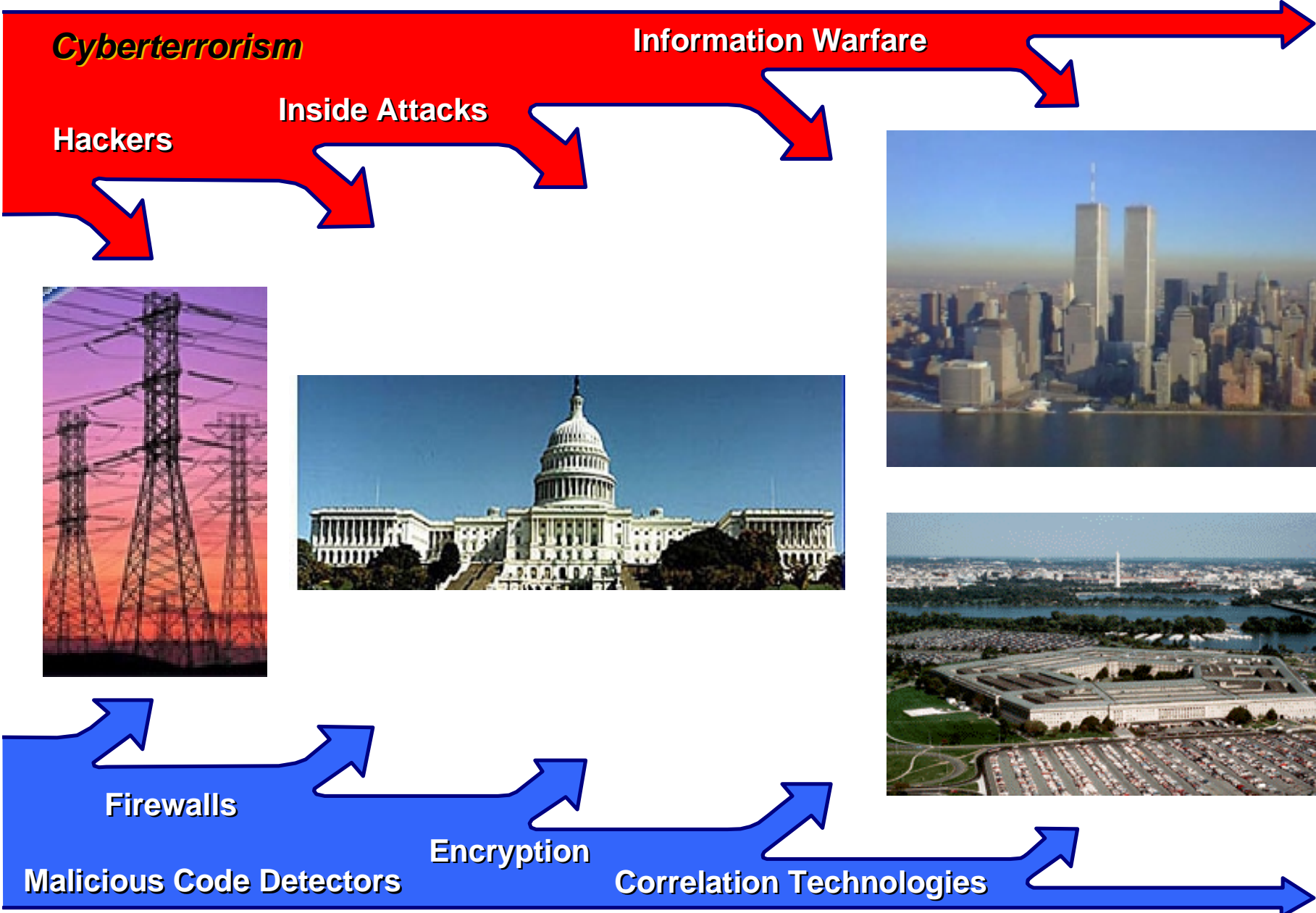
Detection

Protection

Decontamination

Agent Dispersal Modeling

Information Assurance



Cyberterrorism

Information Warfare

Hackers

Inside Attacks



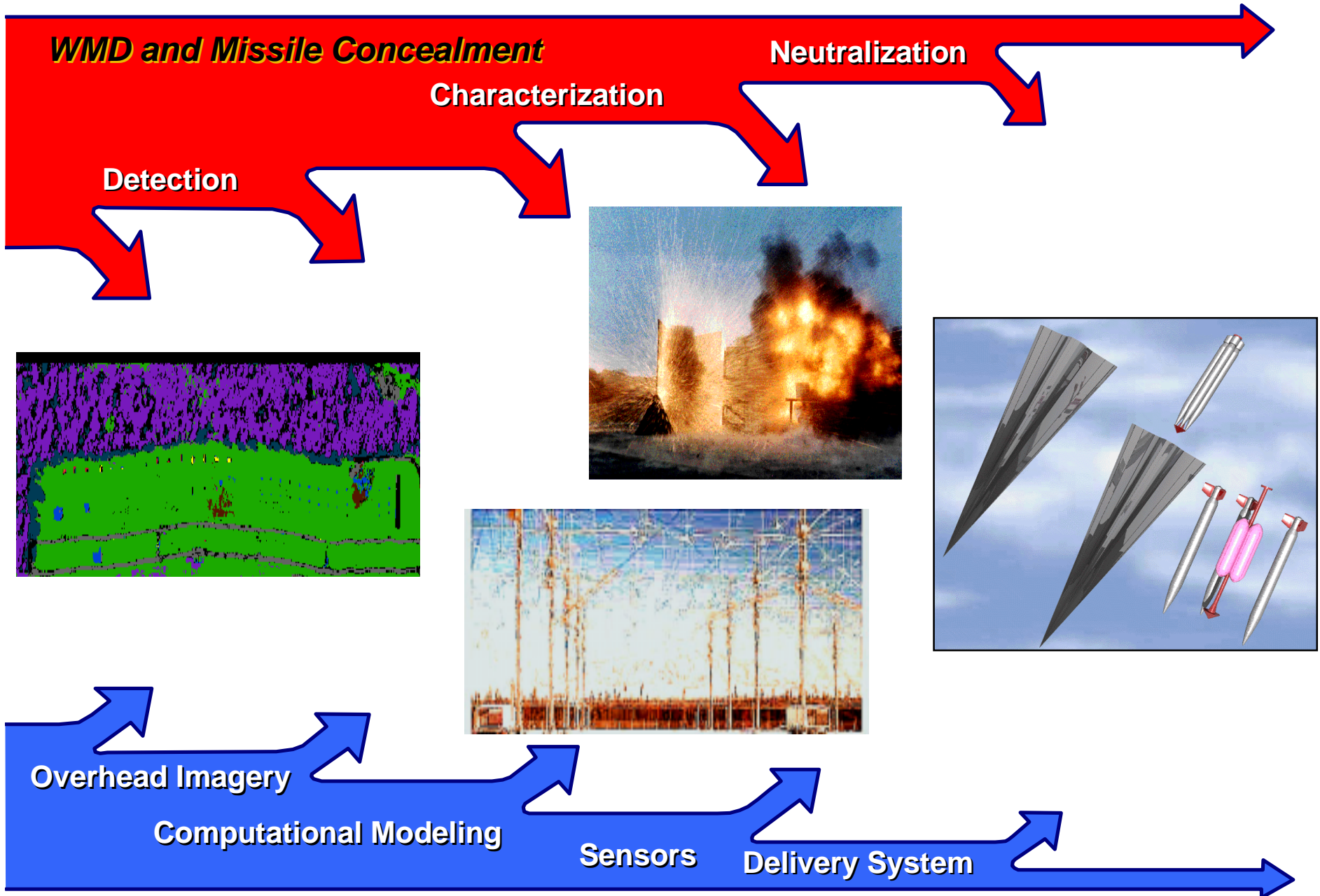
Firewalls

Malicious Code Detectors

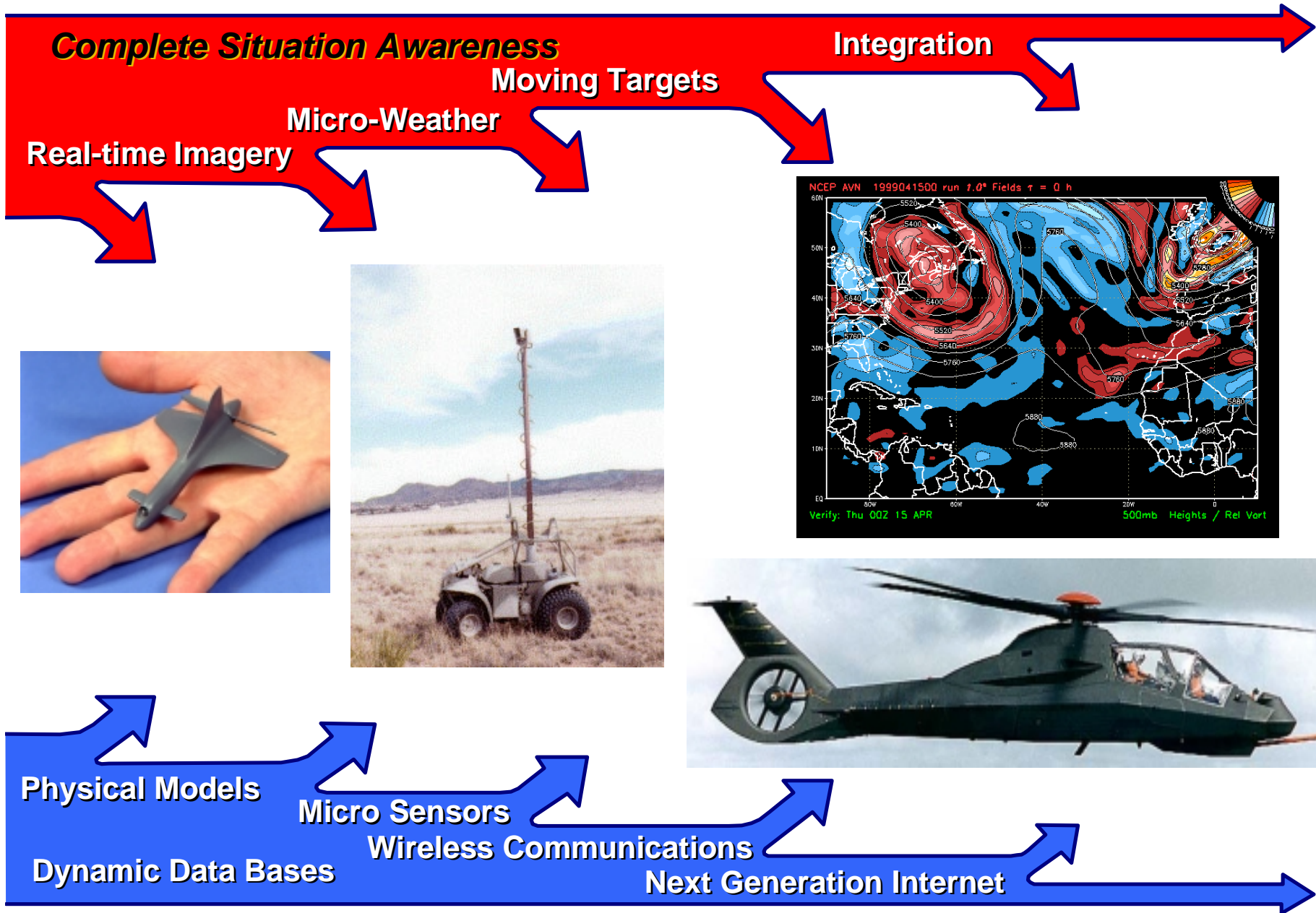
Encryption

Correlation Technologies

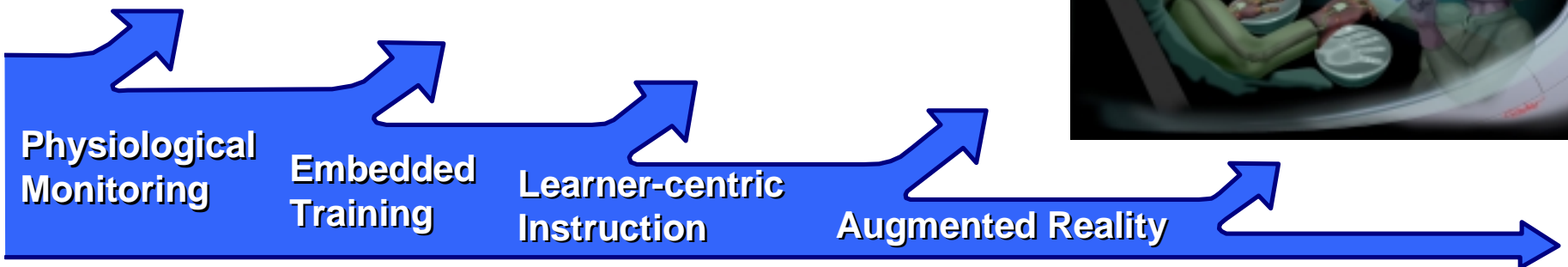
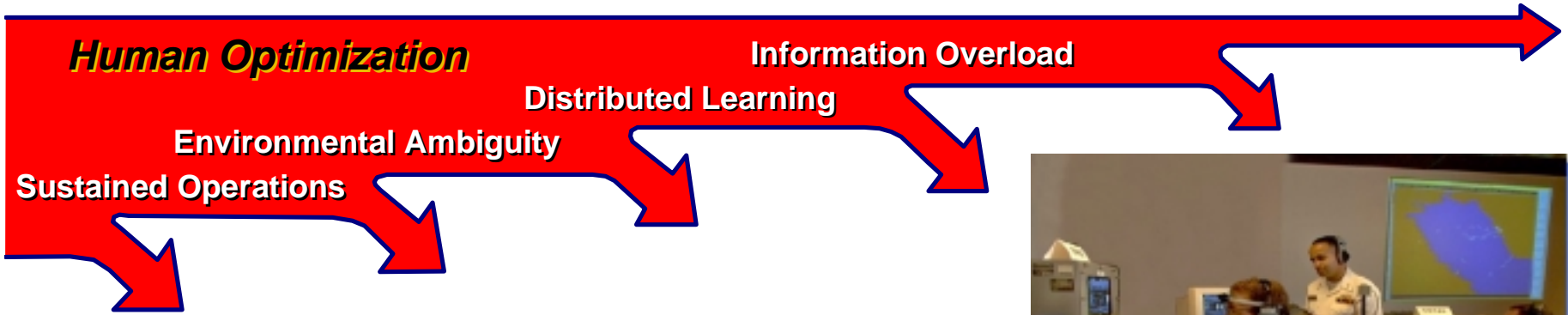
Hardened and Deeply Buried Targets



Smart Sensor Web



Cognitive Readiness



High Performance Computing Modernization Program

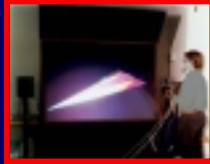
Mission: Provide world-class HPC capability to the DoD science and technology and developmental test and evaluation communities

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



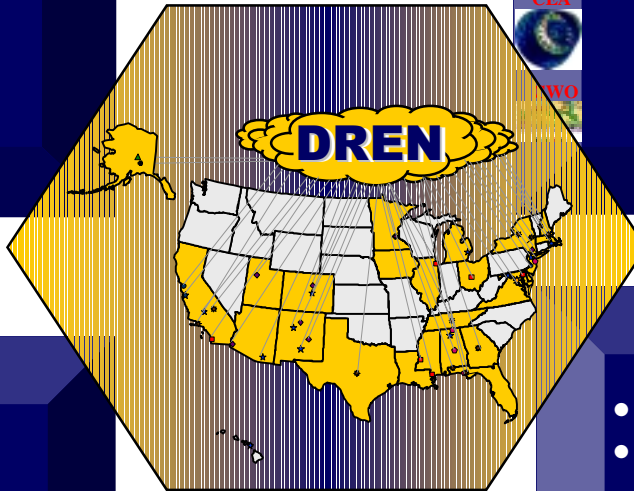
EQM



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:

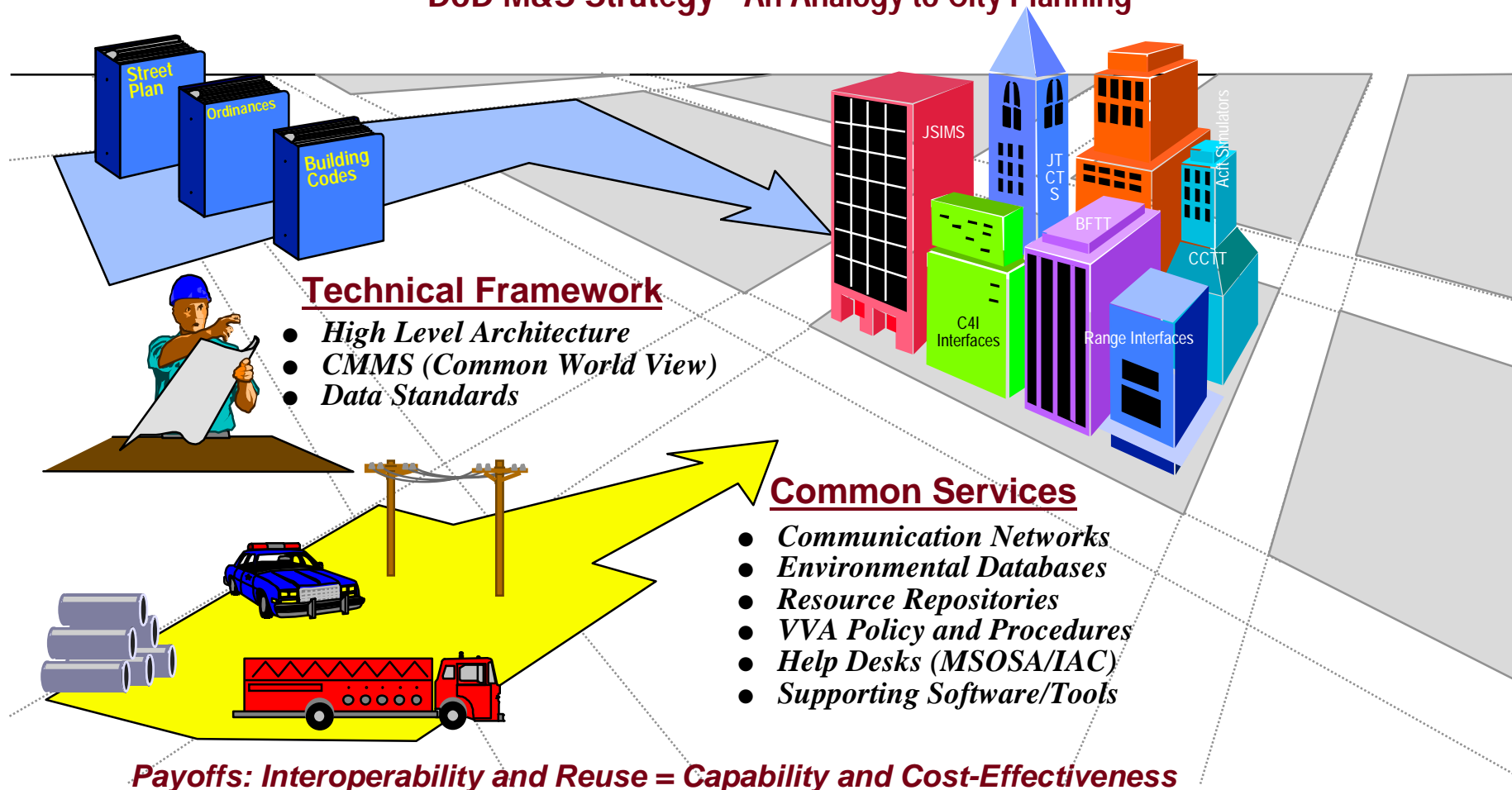
Resource Allocation

- 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



“... 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



- **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**



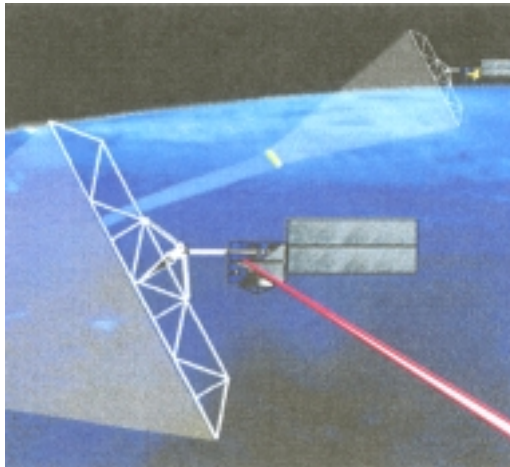
DoD S&T is a Partnership

Stable, Long Term Investment



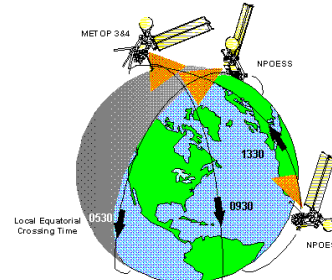
Service Labs

DARPA



High Risk, High Payoff

Expanded Resource Base



Interagency

New Ideas, Knowledge



Universities

Industries



Innovation, Transition

Maximum National Security Payoff

International



Coalition Capability