



DoD Science and Technology

Executive Forum on Modeling and Simulation

30 May 2001

Dr. Delores M. Etter

Deputy Under Secretary of Defense (Science & Technology)

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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.

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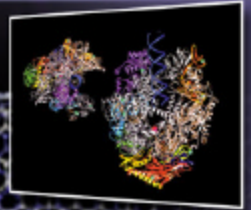
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Mission

. . . 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.

Office of the Deputy Under Secretary of
Defense for Science and Technology



Defense Science and Technology



A Focus on Revolutionary Advances

Stealth



Adaptive Optics and Lasers



GPS



Night Vision



Phased Array Radar





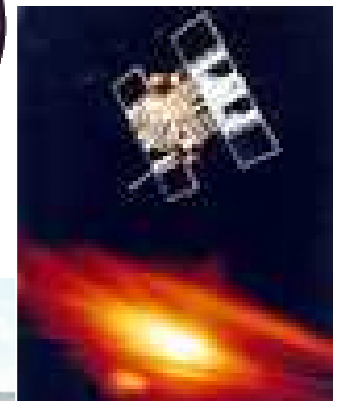
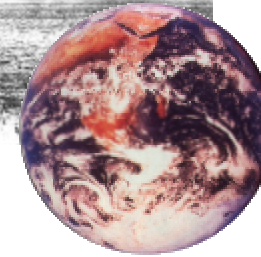
Strategic Environment

Global US Interests

Political - Economic - Humanitarian



Globalization of Technology



Asymmetric Threats

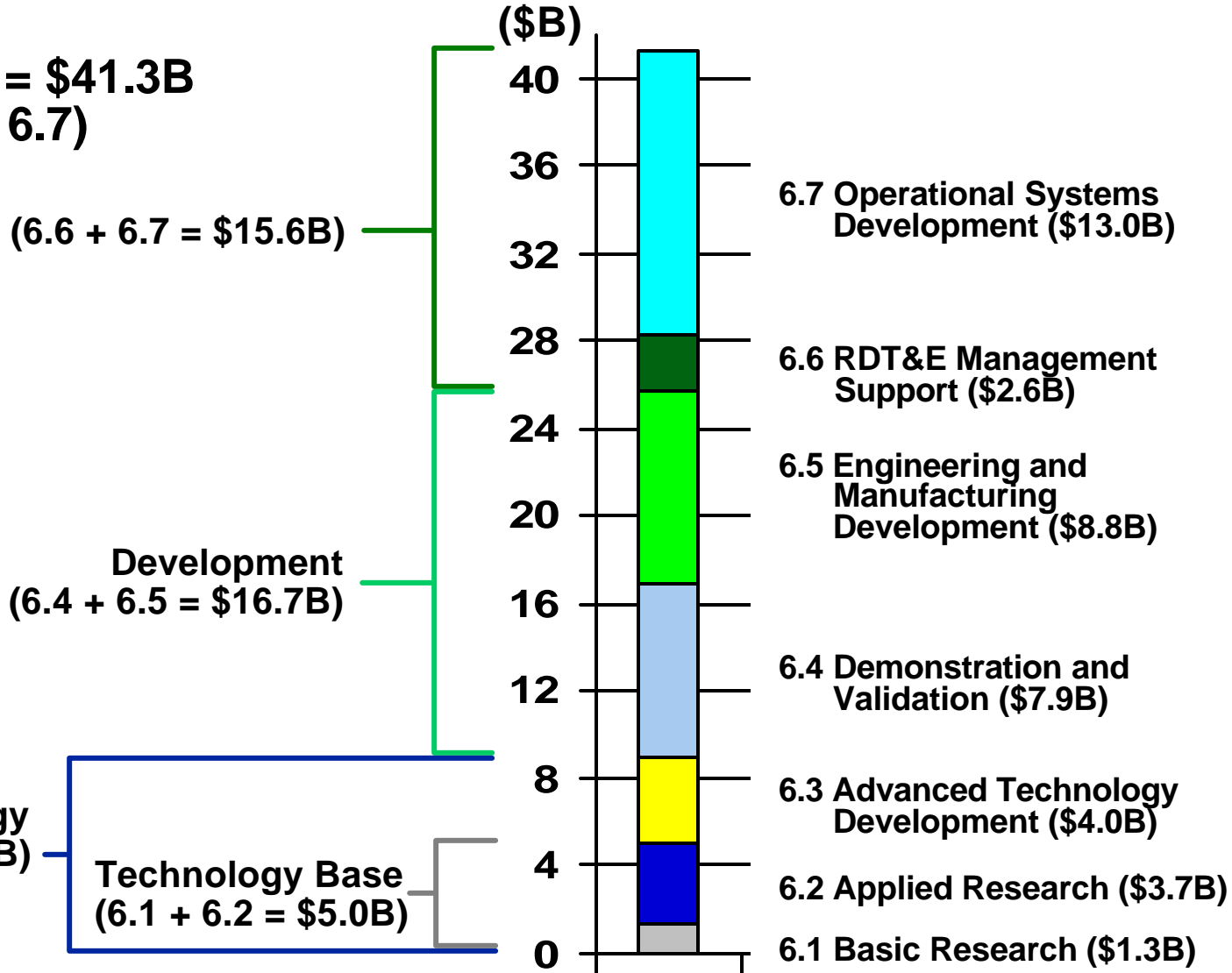
In any domain - Air, Land, Sea, Space or Information





FY01 RDT&E

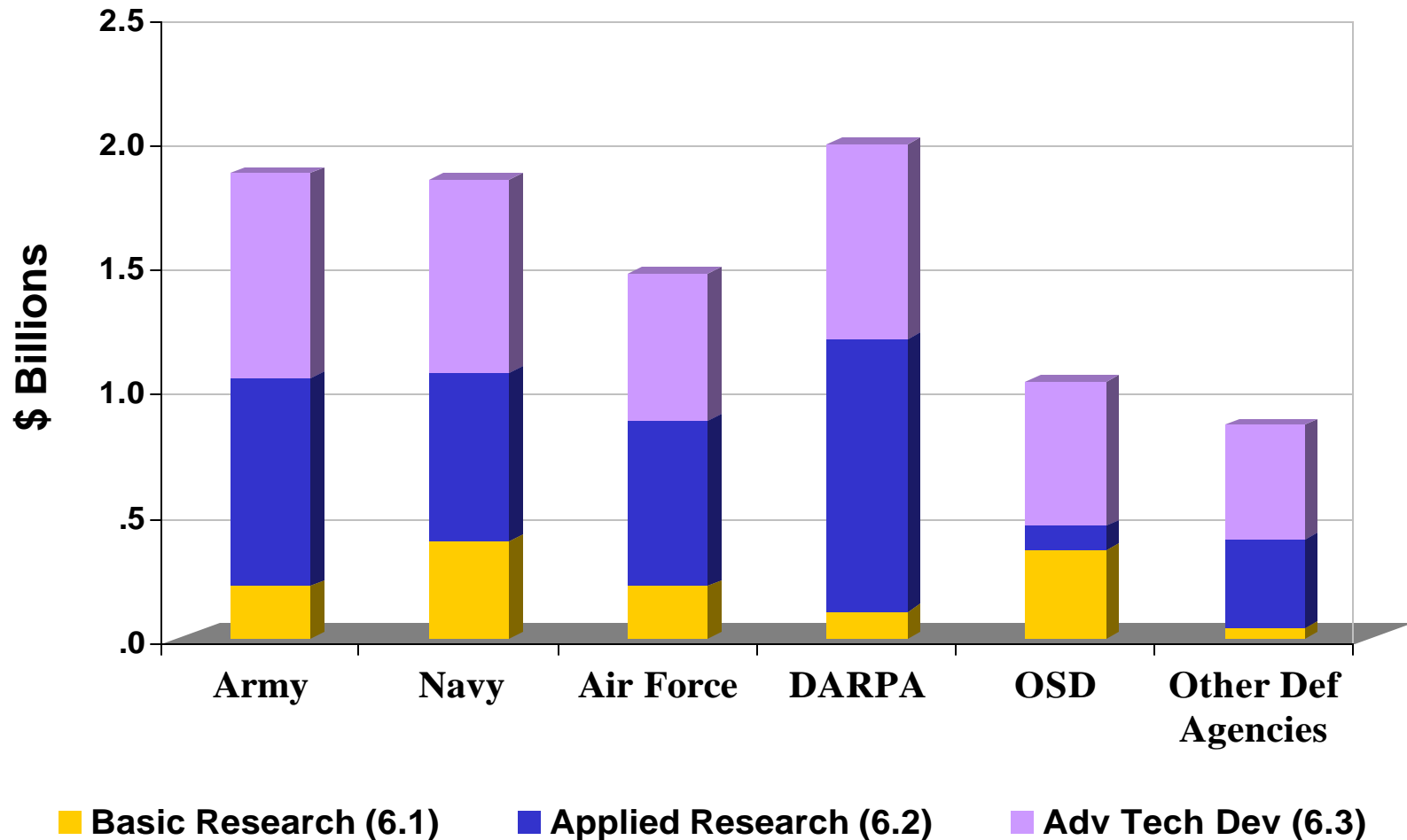
FY01 RDT&E = \$41.3B
(6.1 thru 6.7)



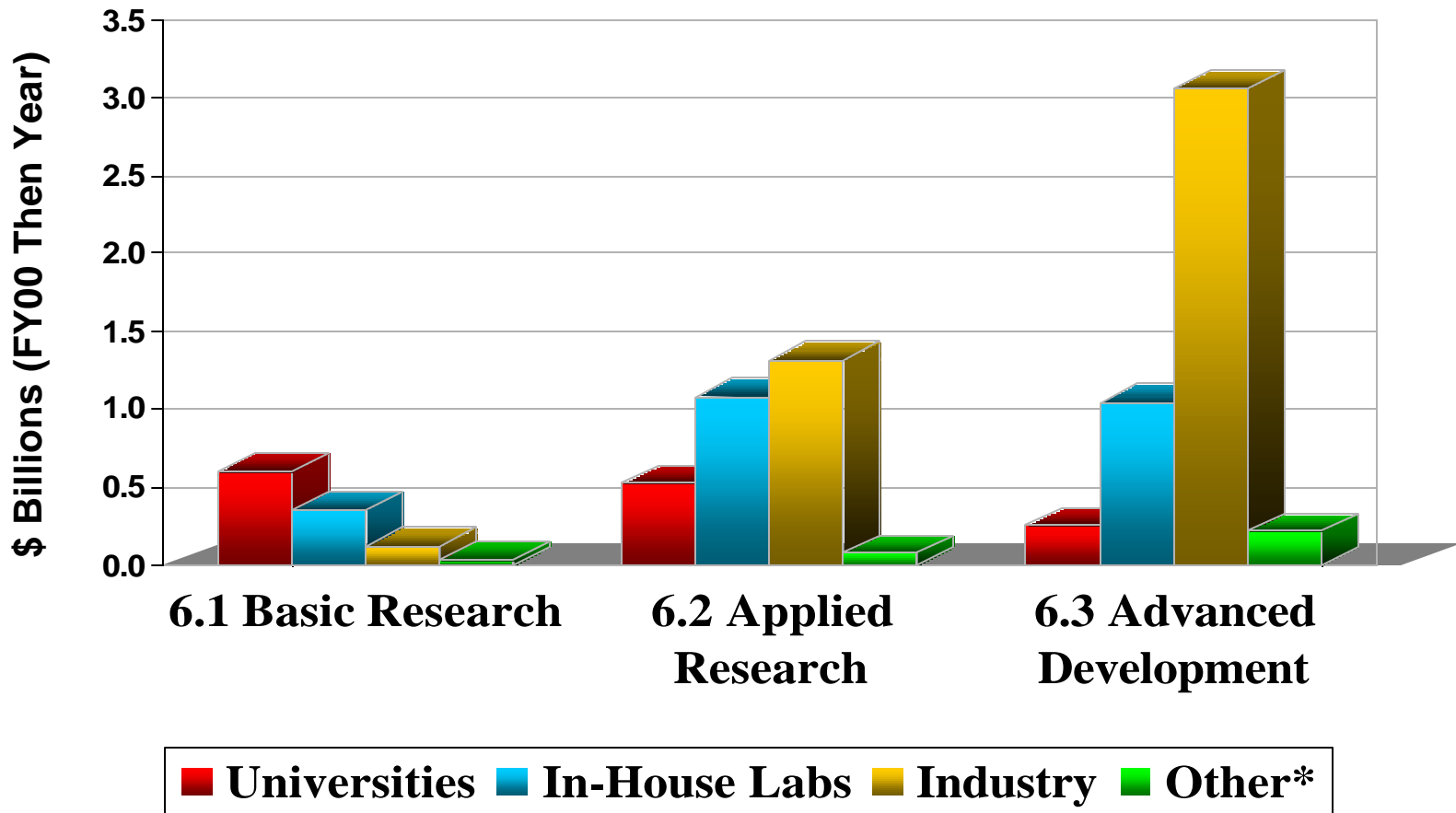
DoD S&T Investment



Total FY01 S&T = \$9.0B



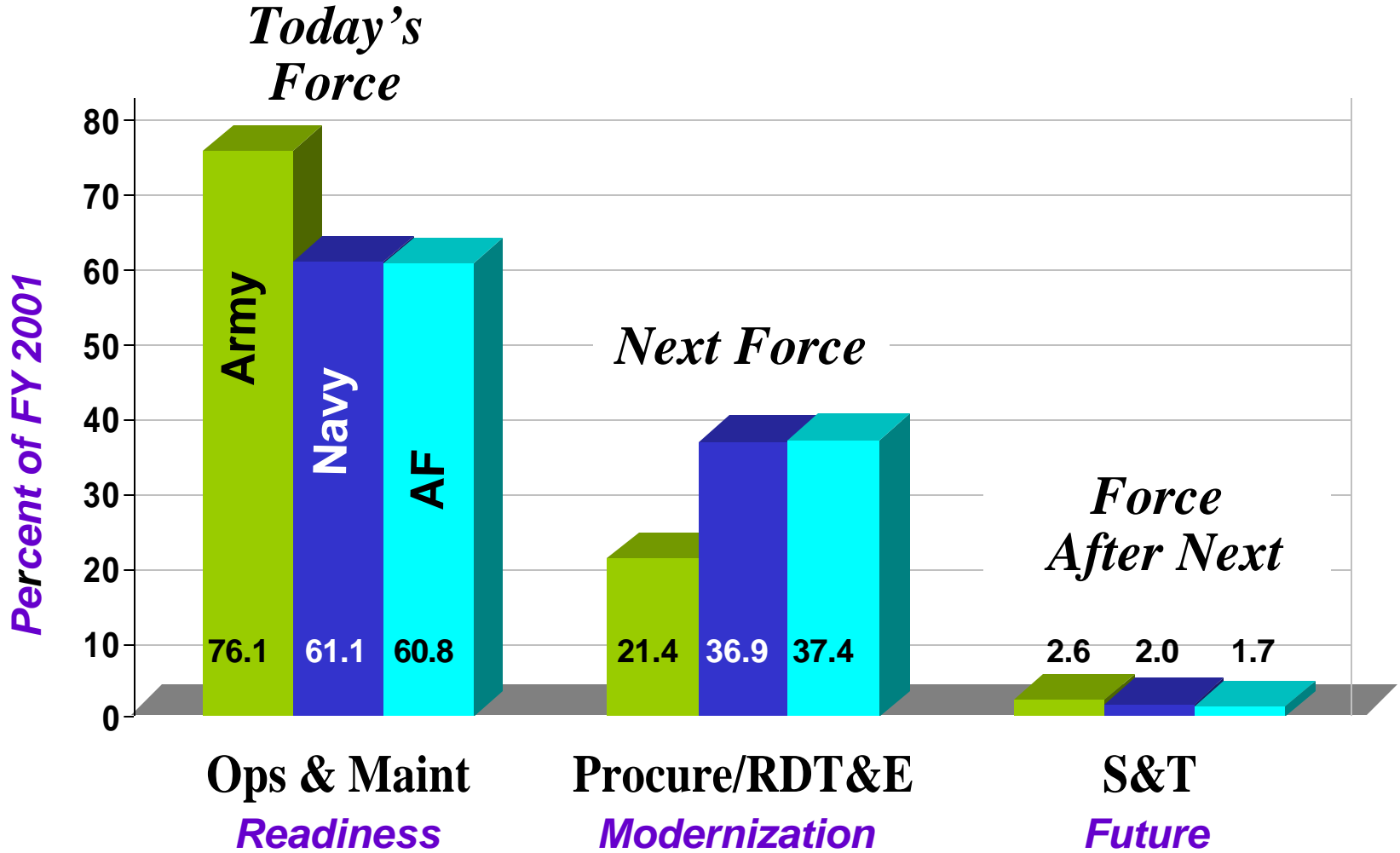
Recipients of DoD S&T Funds



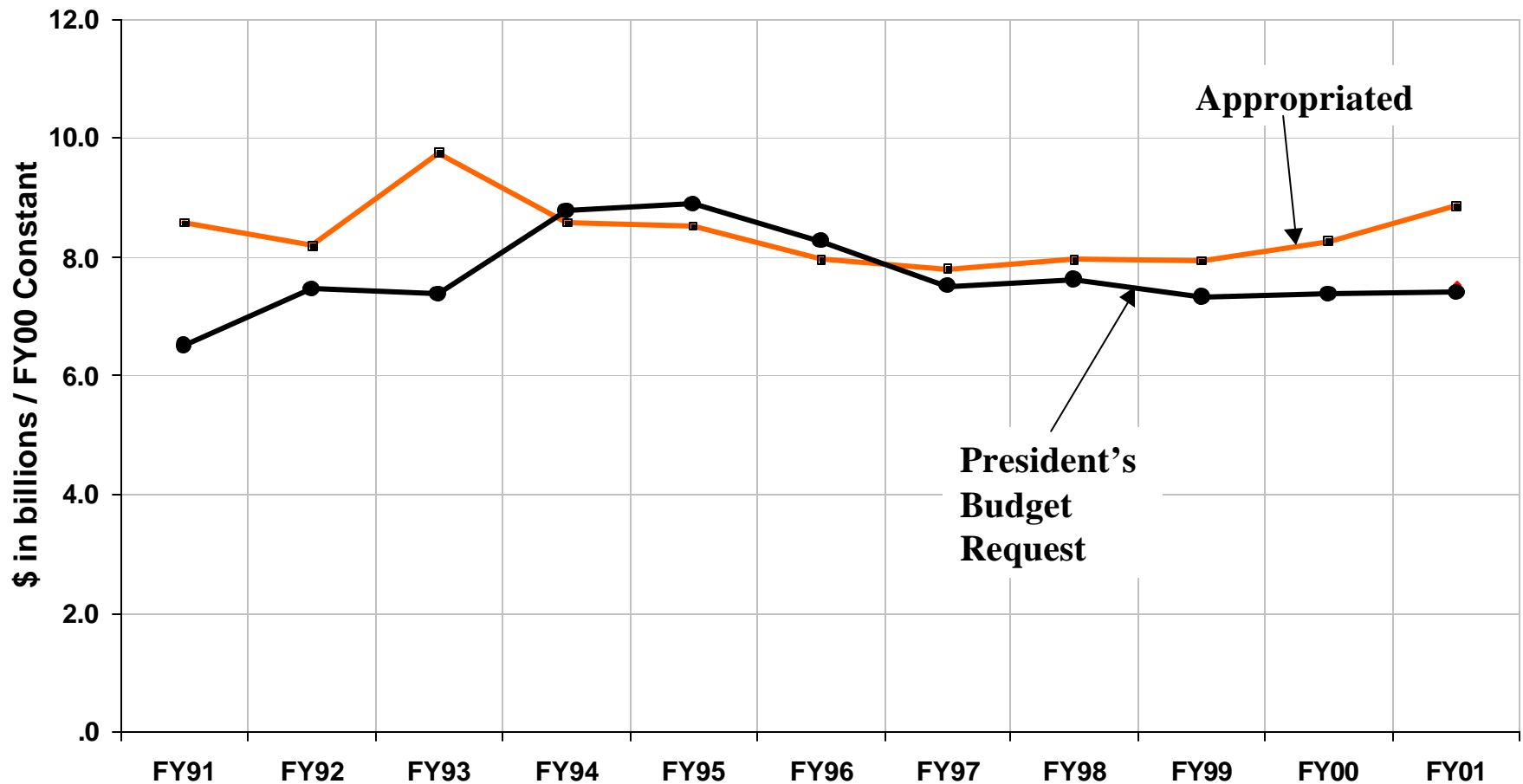
*Includes non-profit institutions, State & local govt., & foreign institutions

Source: National Science Foundation Report, Volume 48 (FY 2000)

Technology Perspectives FY01



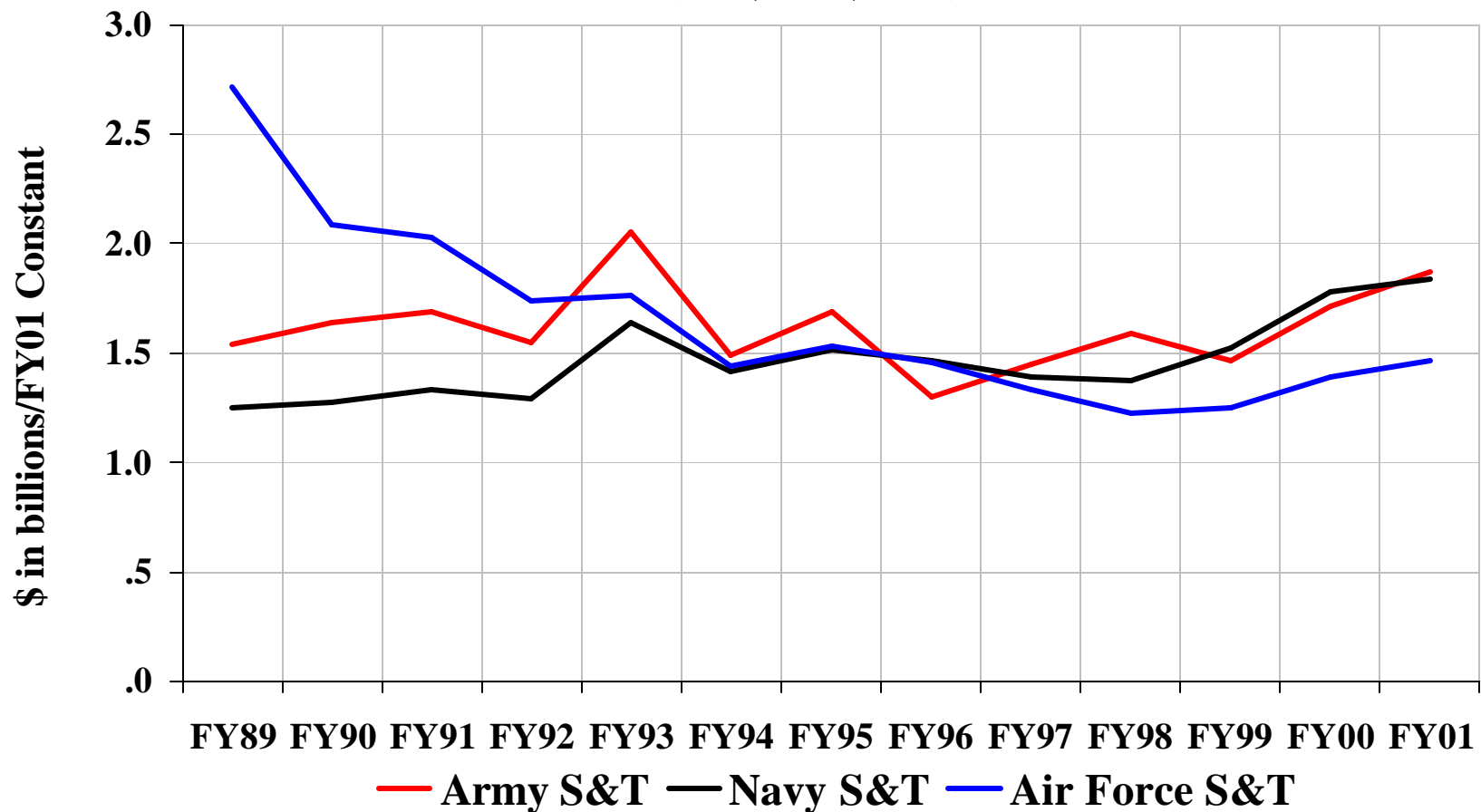
Department of Defense Science & Technology (S&T)



Service Investment in Science & Technology



Services Science & Technology (S&T) (6.1, 6.2, 6.3)



DUSD (S&T) Priorities 2001

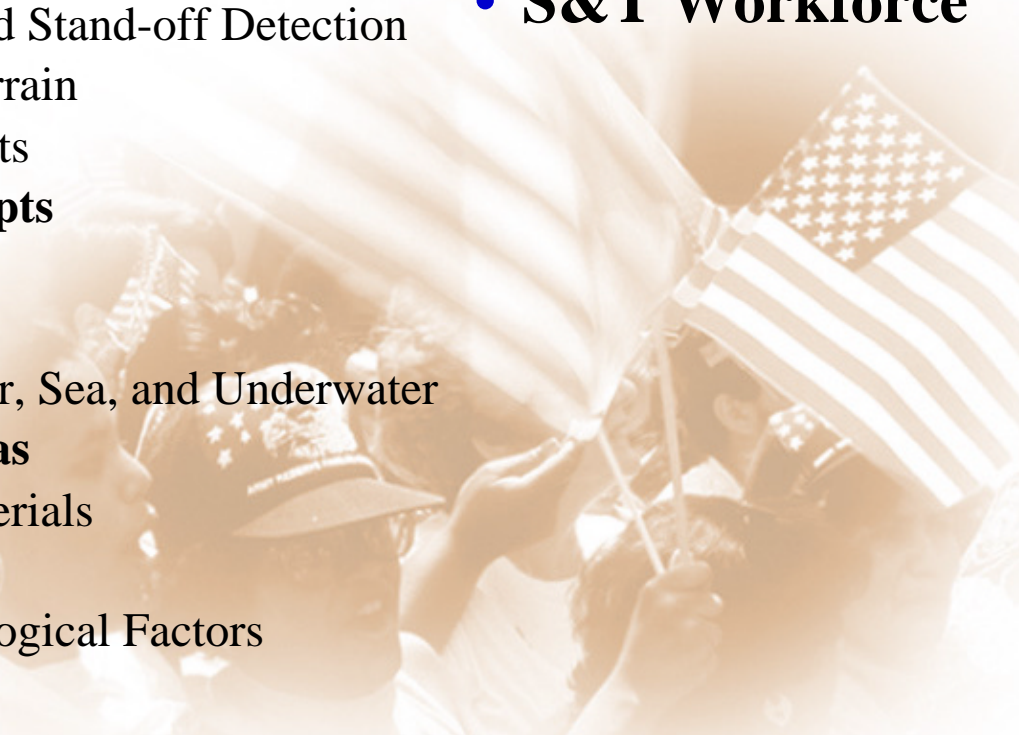


Technical

- **Basic Research**
- **Strategic Initiatives**
 - **Hard Problems**
 - Time Critical, Standoff and Concealed Target Defeat
 - Cruise and Ballistic Missile Defense
 - Chem-Bio Defense Modeling and Stand-off Detection
 - Military Operations in Urban Terrain
 - Counters to Asymmetrical Threats
 - **Revolutionary Warfighting Concepts**
 - Fuller Dominance of Space
 - Network Centric Warfare
 - Unmanned Systems for Land, Air, Sea, and Underwater
 - **Military Significant Research Areas**
 - Nanoscience and Advanced Materials
 - Advanced Power
 - Human Dimensions and Psychological Factors
 - Directed Energy

Non-Technical

- **Funding Stability**
- **Technology Transition**
- **S&T Workforce**



Basic Research



Microsatellites



Joint Strike Fighter



Micro Air Vehicles



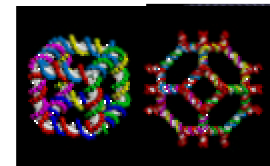
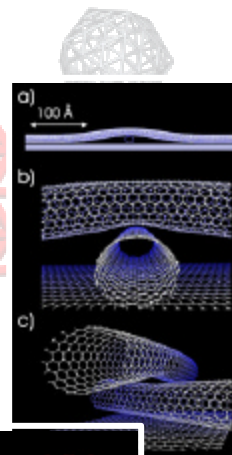
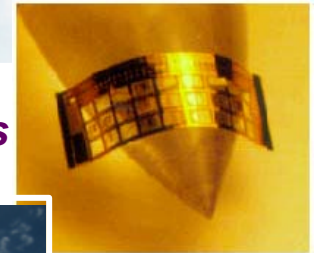
Micro Robots



DD-21



Flexible Sensor Skins

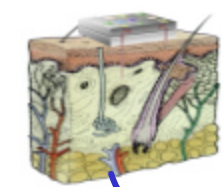


Nanotechnology



Augmented Reality

Bio Sensors



Handheld

Embedded Biofluidic Chips

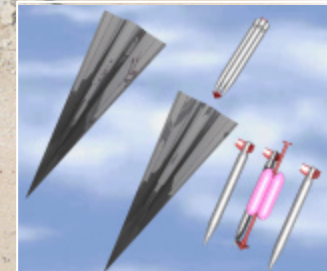
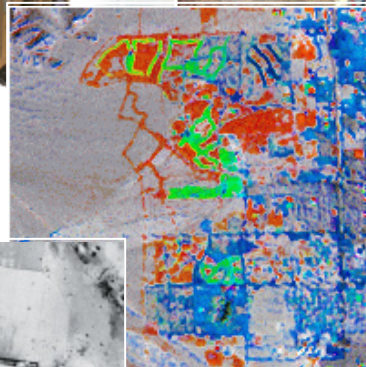
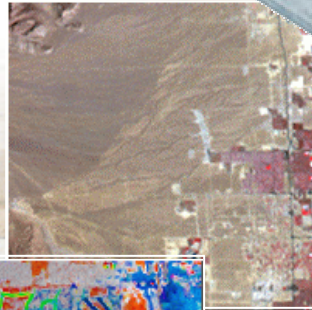


Hard Problems



Time Critical, Standoff, and Concealed Target Defeat

- **Locate**
- **Characterize**
- **Defeat**
- **Assess**



Hardened and Deeply Buried Targets
Concealed Targets
Slowly Moving Targets

Provides capability to safely identify and strike intended targets.

Cruise and Ballistic Missile Defense

- **Detect**
- **Track**
- **Negate**
- **Protect**



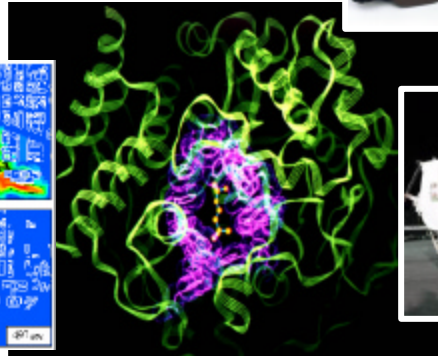
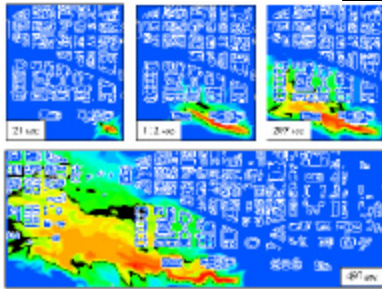
Provides capability to remotely detect, track, and negate cruise and ballistic missile threats.

Hard Problems



Chem-Bio Defense Modeling and Stand-off Detection

- **Detect**
- **Predict**
- **Characterize agent toxicity**
- **Determine genetic/chemical composition**
- **Model & simulate**



Provides real-time capability to remotely detect chemical and biological agents and forecast their dispersion.



Military Operations in Urban Terrain

- **Enhance understanding**
- **Improve training**
- **Expand mission rehearsal capabilities**
- **Provide fast, safe breaching capabilities**
- **Neutralize threat**



Provides capability to engage threat forces in an urban environment.

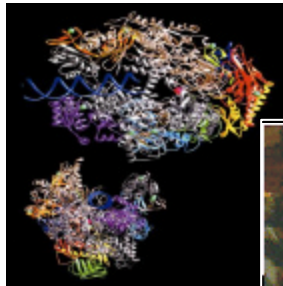


Hard Problems

Counters to Asymmetrical Threats

- ***Understand unconventional threats***
- ***Predict human behavior***
- ***Develop decision support aids***
- ***Dissuade***

“Win without fighting”

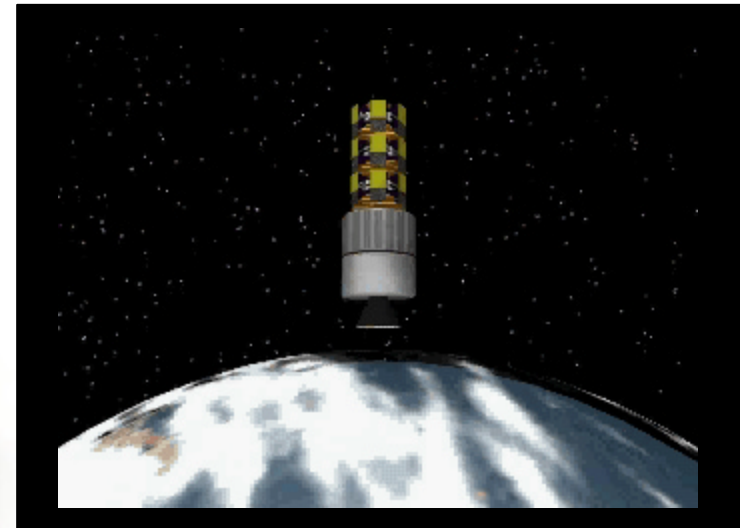
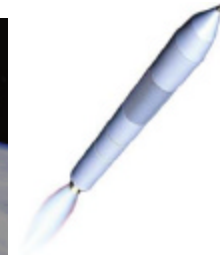
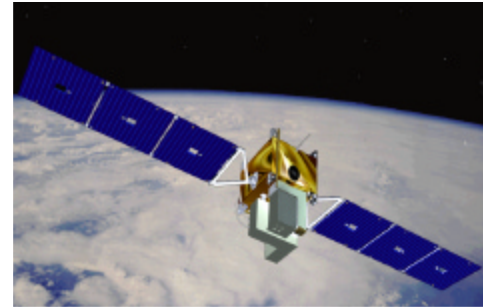


Provides improved information operations, computational models, and social science theory to allow commander to shape engagement without force.

Revolutionary Warfighting Concepts Fuller Dominance of Space



- *Develop affordable space transportation*
- *Assure space surveillance*
- *Control space*
- *Protect on-orbit assets*
- *Apply force from space*



Provides capability to fully exploit space, conducting operations at will.

Revolutionary Warfighting Concepts

Network Centric Warfare



- **Develop robust connectivity and interoperability**
- **Provide information assurance**
- **Improve decision support**
- **Exploit high performance computing**

Smart Sensor Web



Software Intensive Systems

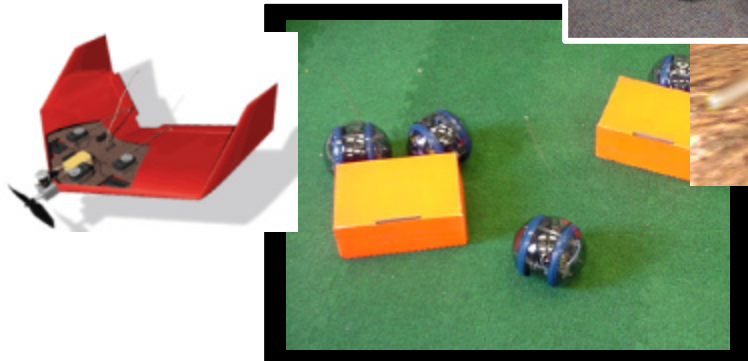
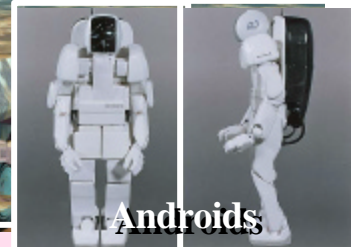
Provides increased combat power by networking sensors, decision makers, and mission executors, to achieve shared awareness, self-synchronization, and improved operations.

Revolutionary Warfighting Concepts



Unmanned Systems for Land, Air, Sea, and Underwater

- **Control assets remotely**
- **Miniaturize components**
- **Integrate information**
- **Develop collective behavior**
- **Develop distributed operations**

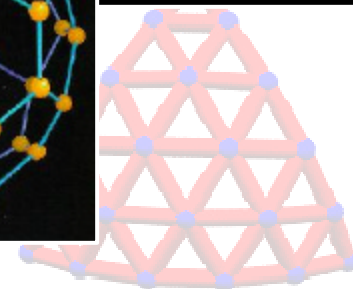
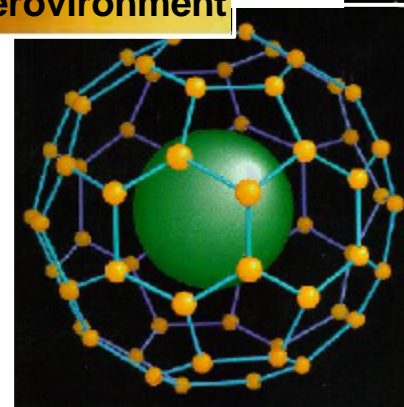
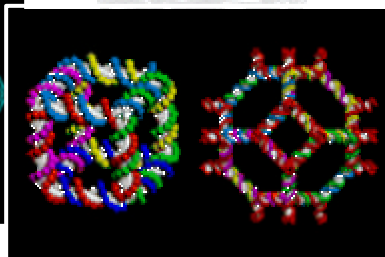
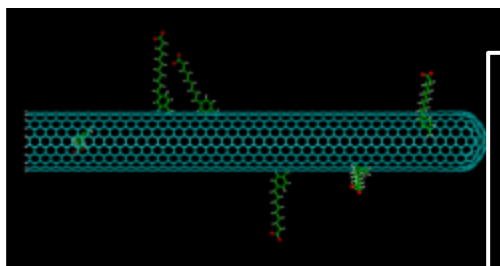
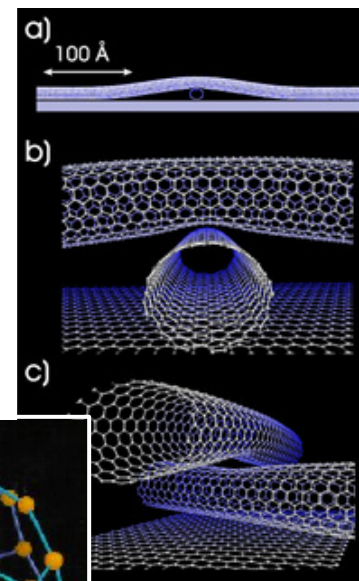
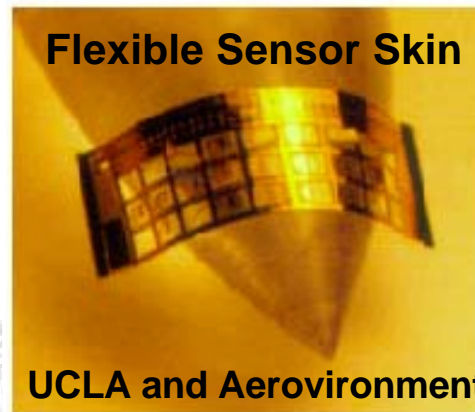


Provides capability to safely execute an expanded range of missions .



- **Exploit:**

- Carbon computers
- Molecular engineering
- Nanoscale robots, sensors, machines
- Battery electrode and energy storage
- Vacuum microelectronics devices
- Molecular composites



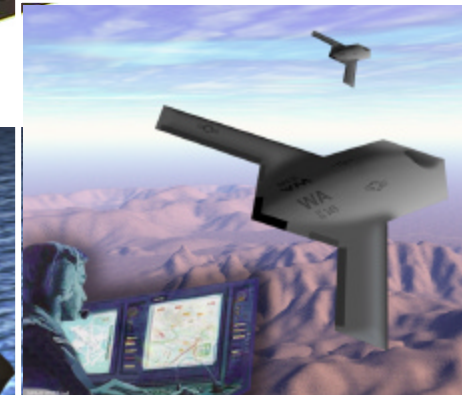
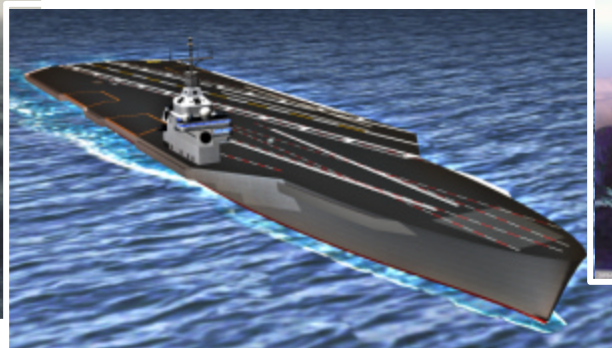
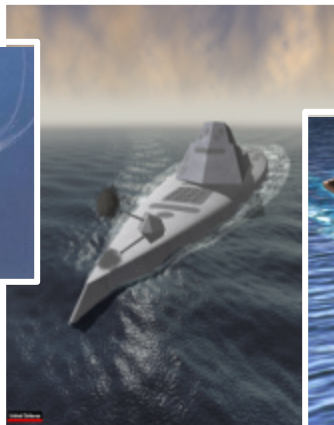
Provides opportunity to develop totally new operational concepts and capabilities.

Militarily Significant Research Areas

Advanced Power



- *Improve energy storage and release*
- *Enhance power generation/distribution*
- *Develop new power applications*
- *Exploit electric drive*
- *Enhance propulsion technologies*



Provides opportunity to more efficiently project a capability throughout the battlespace.

Militarily Significant Research Areas

Human Dimension and Psychological Factors



- *Improve training aids*
- *Develop decision making skills*
- *Improve cognitive readiness*
- *Enhance performance*



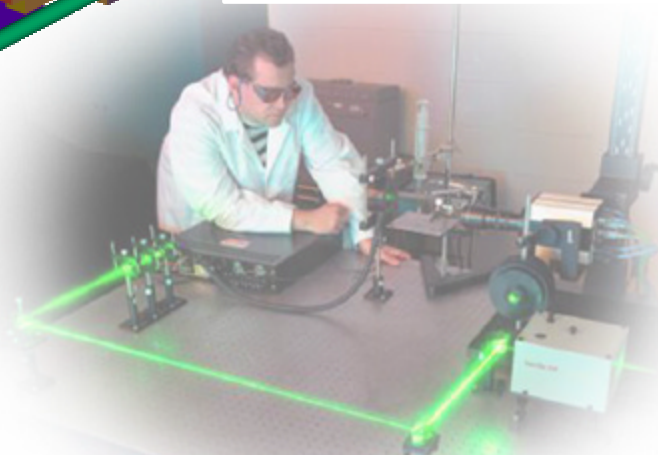
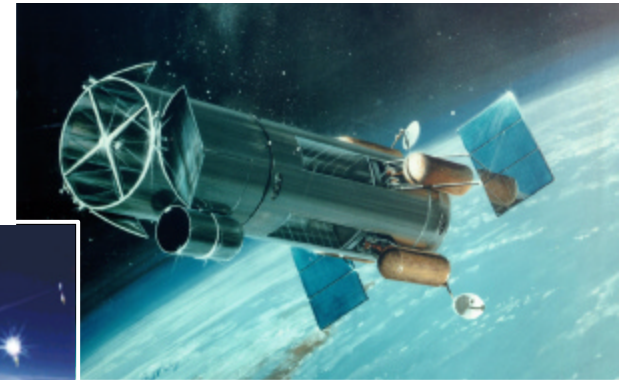
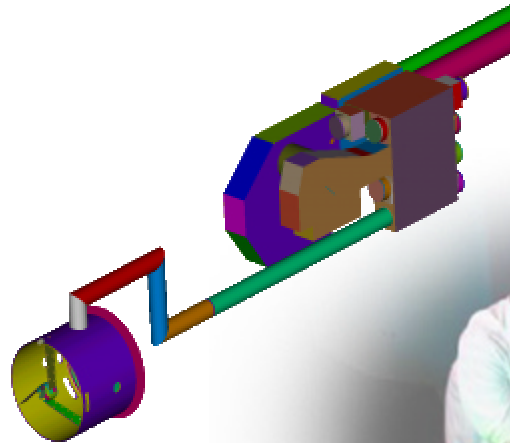
Provides opportunity to improve human information recognition and retention.

Militarily Significant Research Areas

Directed Energy



- **Exploit:**
 - **High energy lasers**
 - **High powered microwaves**



Provides opportunity to revolutionize operations in traditional battlespace environments.

Defense Modeling & Simulation Office Vision



“**Lead** and **Integrate** the DoD M&S community, and **Leverage** M&S science and technology advances to ensure that the warfighters of today and tomorrow have superior and affordable M&S tools, products and capabilities to support their missions and to give them revolutionary war-winning capabilities.”

*Lead, Integrate and Leverage M&S
for the Warfighter*



Defense Modeling & Simulation Office Priorities



- **Joint Warfighter Requirements**
 - Support to CINCs & Services
 - Joint Program Support (JSIMS, JMASS, JWARS) & Integration
- **Enterprise Activities**
 - High Level Architecture Transition
 - Simulation Interoperability Standards
 - Synthetic Environment
- **Science & Technology Initiatives / Concepts Applications**
 - Human and Group Behavior
 - Simulation Based Acquisition
 - Technology Demonstration
- **Community Services & Coordination**
 - M&S Integration Task Force & DoD M&S Master Plan
 - M&S Information Analysis Center
 - M&S Resource Repository
 - Outreach

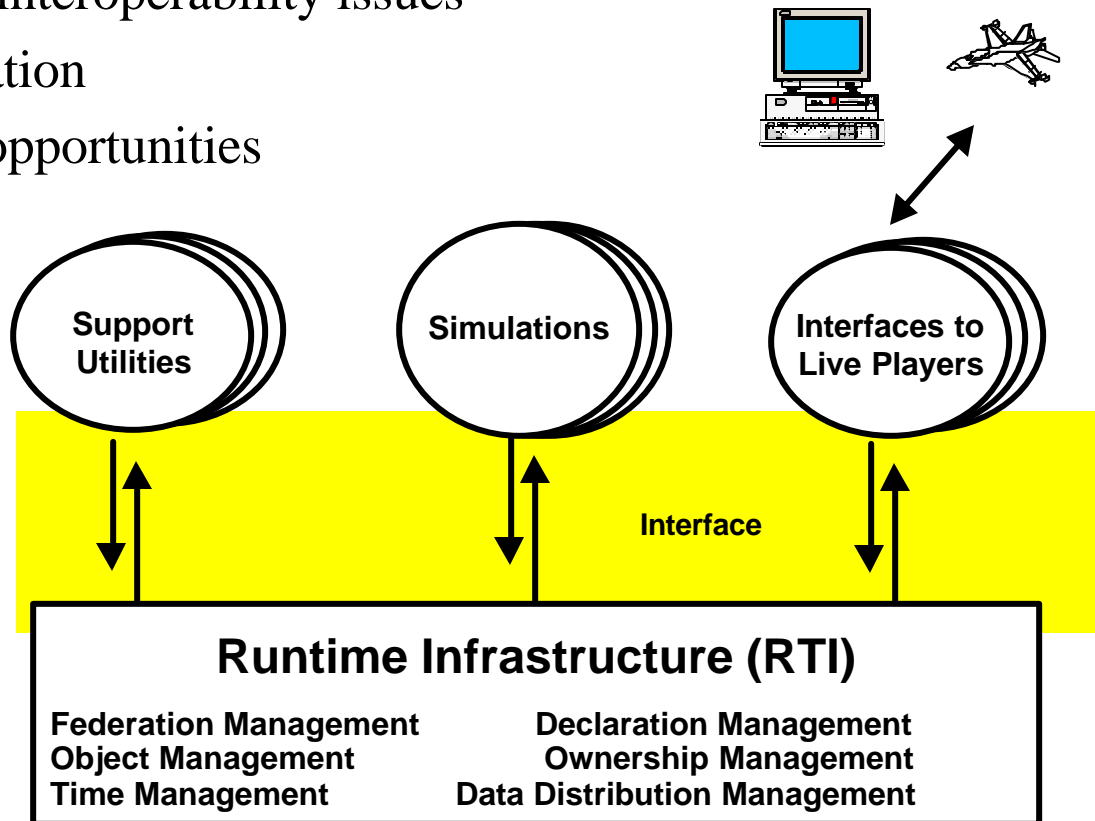


DMSO Accomplishment: High Level Architecture (HLA)



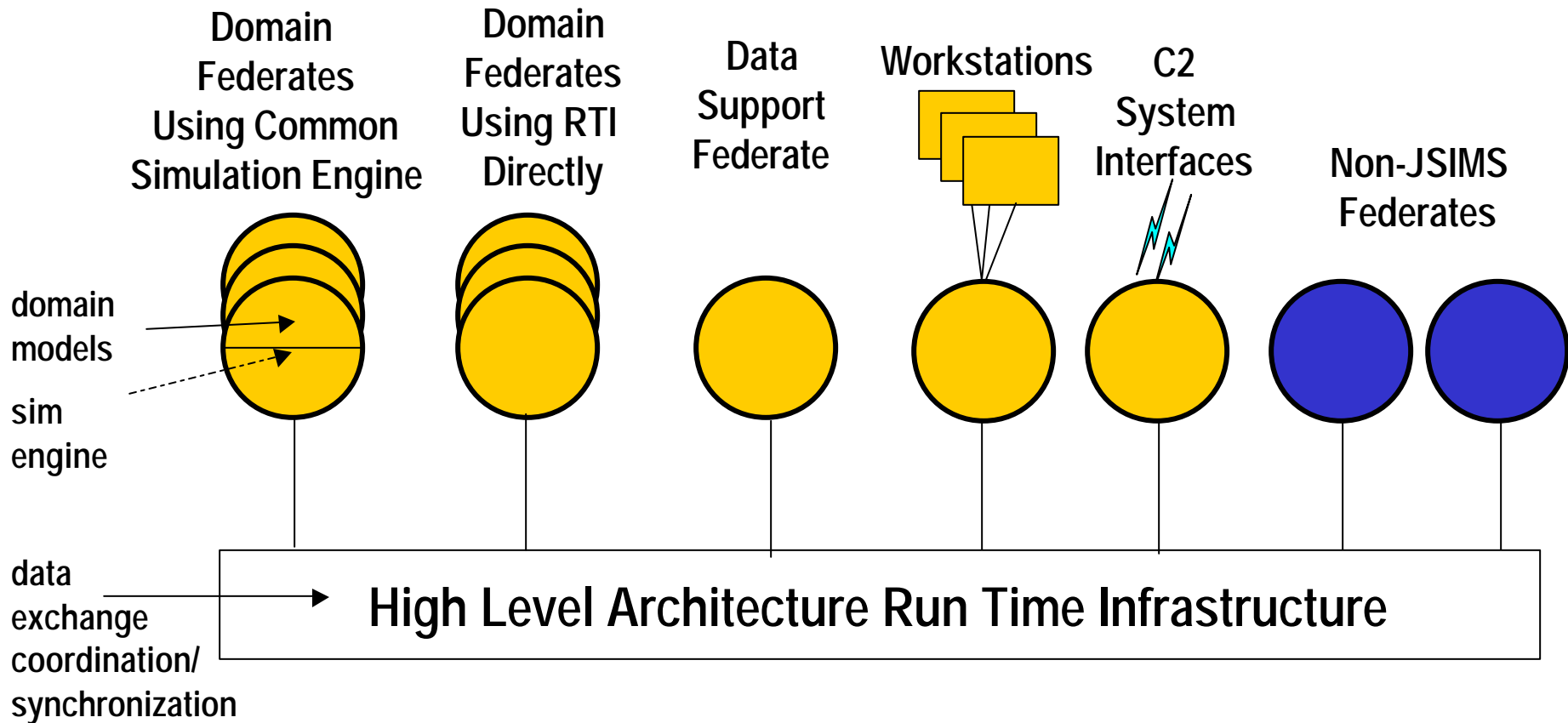
HLA: technical architecture for interoperability and reuse - Nov 2000

- IEEE standardization
- Focused community on real interoperability issues
- Enabled cross domain federation
- Created reuse products and opportunities
- Brought rigorous systems engineering to federation development
- 60% to 80% community technology adoption (SEI study)





Joint Simulation System (JSIMS)



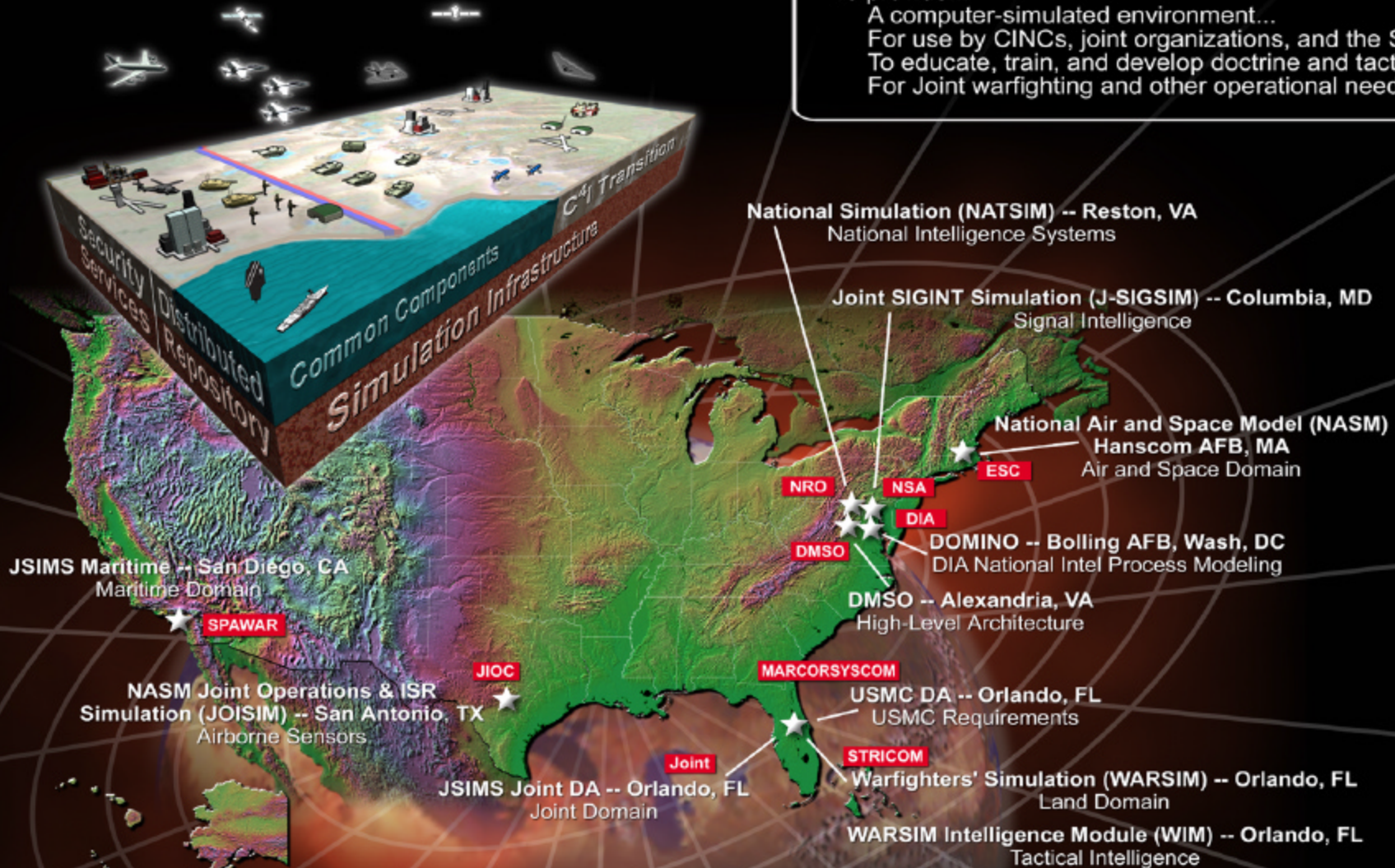


JOINT SIMULATION SYSTEM (JSIMS)

JSIMS ALLIANCE ACROSS THE NATION

MISSION

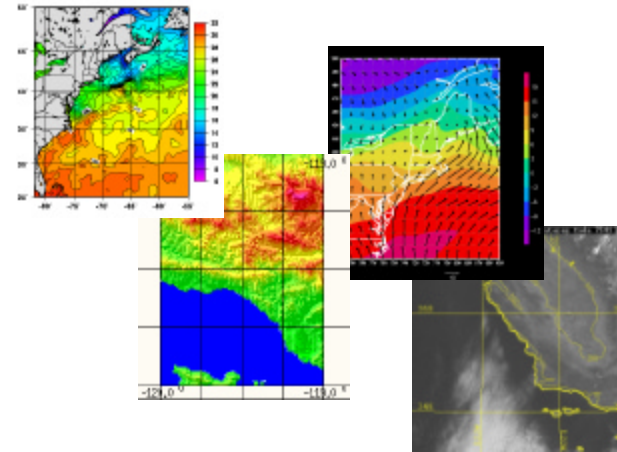
To provide...
A computer-simulated environment...
For use by CINCs, joint organizations, and the Services...
To educate, train, and develop doctrine and tactics...
For Joint warfighting and other operational needs.



DMSO Accomplishment: Integrated Natural Environment Program



*Provides the warfighter
integrated authoritative
representations of the
natural environment*



*Effect of high winds on
concealment smoke changed
outcome of the battle.*

Environmental data from the various domains

- Released SEDRIS Interoperability Standards and software tools
- SEDRIS specified in acquisition of Army, Joint, and NATO systems
- Demonstrated use of dynamic run-time natural environment
- Increased environmental data records available in library by 30,000

Current DMSO Focus: Human Behavior Representation



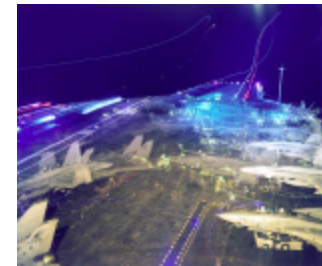
Training



Systems Analysis

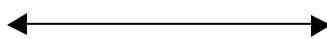


Command Decision Aiding

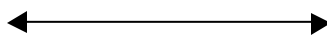


System Acquisition

Individuals



Teams



Organizations

Human Behavior represented within M&S:

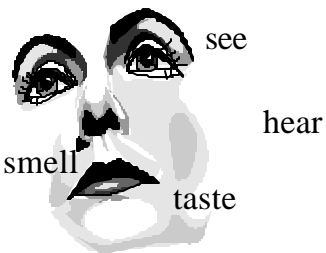
Sensing & Perception

Physical Movement

Information Processing

Decision Making

Communication & Coordination



Vision: To enhance warfighter decisions by enabling valid models using credible data that reflect realistic human behavior.

S&T Requires Strong Partnerships

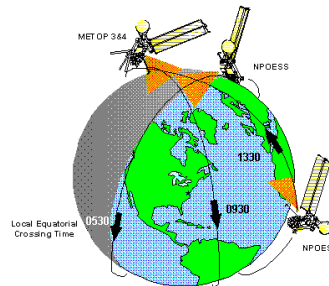


Link to the Warfighter



Service Labs

Expanded Resource Base



Interagency

New Ideas, Knowledge

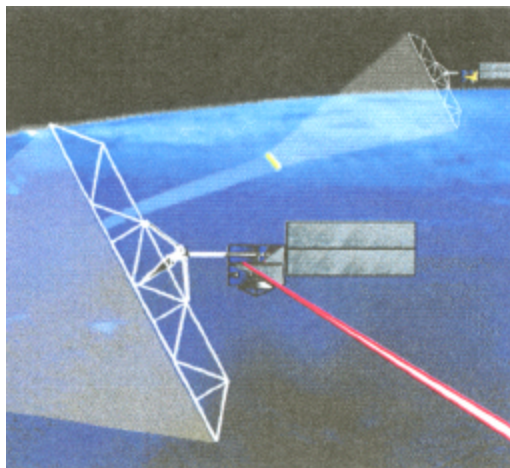


Universities

Industries

Maximum National Security Payoff

DARPA



High Risk, High Payoff

International



Coalition Capability



Innovation, Transition

