DoD Basic Research Program with a Focus on Academia

National Defense Industrial Association
8th Annual Science & Engineering
Technology Conference
North Charleston, SC.

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Deputy Under Secretary of Defense
(Laboratories and Basic Sciences)
17 April 2007

OUTLINE

- DoD Funding and Priorities
  - Emphasis on Basic Research
- Strategic Planning
- National Defense Education Program
  - Relationship to DoD future workforce
  - National Security Science and Engineering Faculty Fellowships
  - Science and Engineering Enrichment
    - Materials World Modules
    - Pre-Engineering Modules

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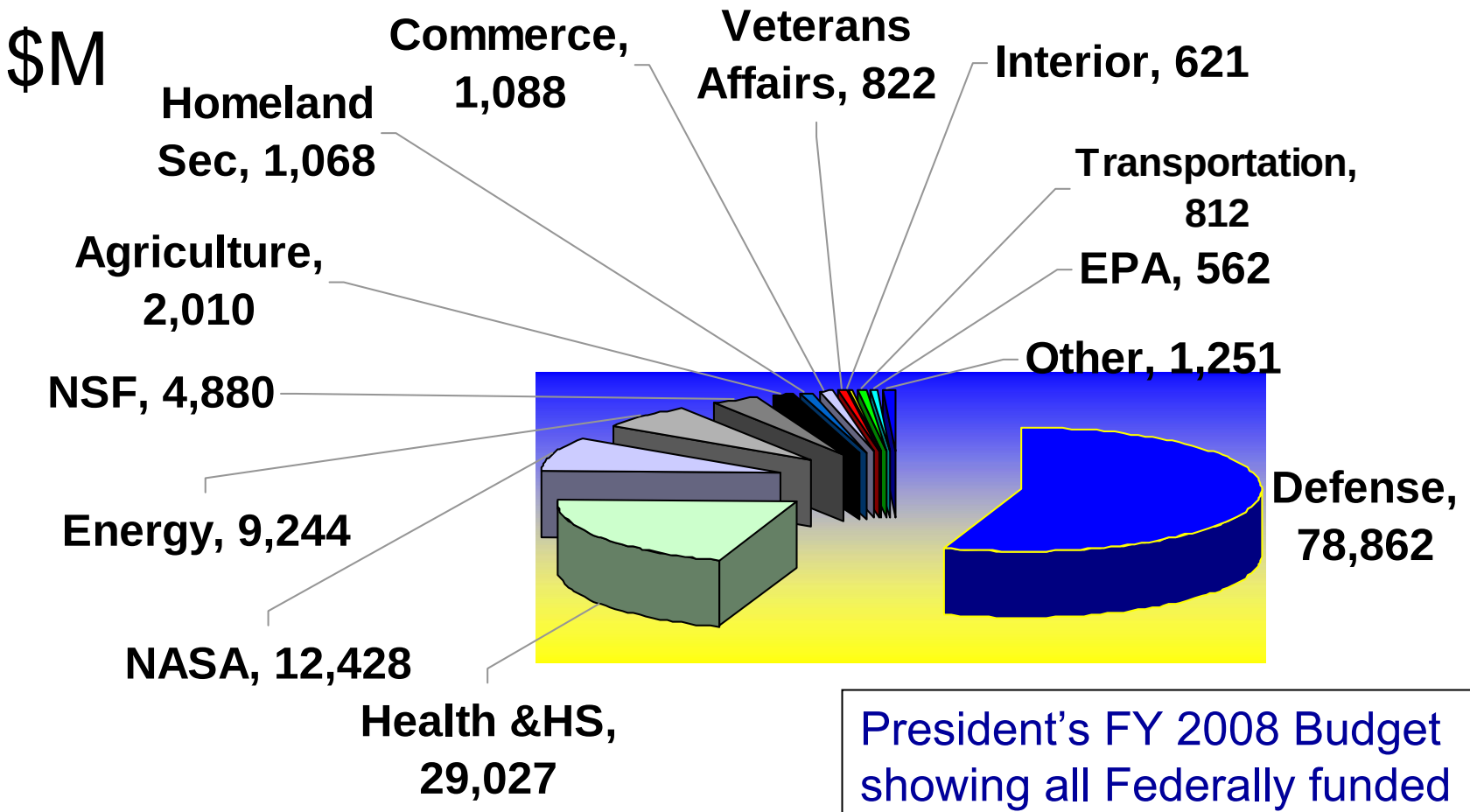
Federal R&D Funding

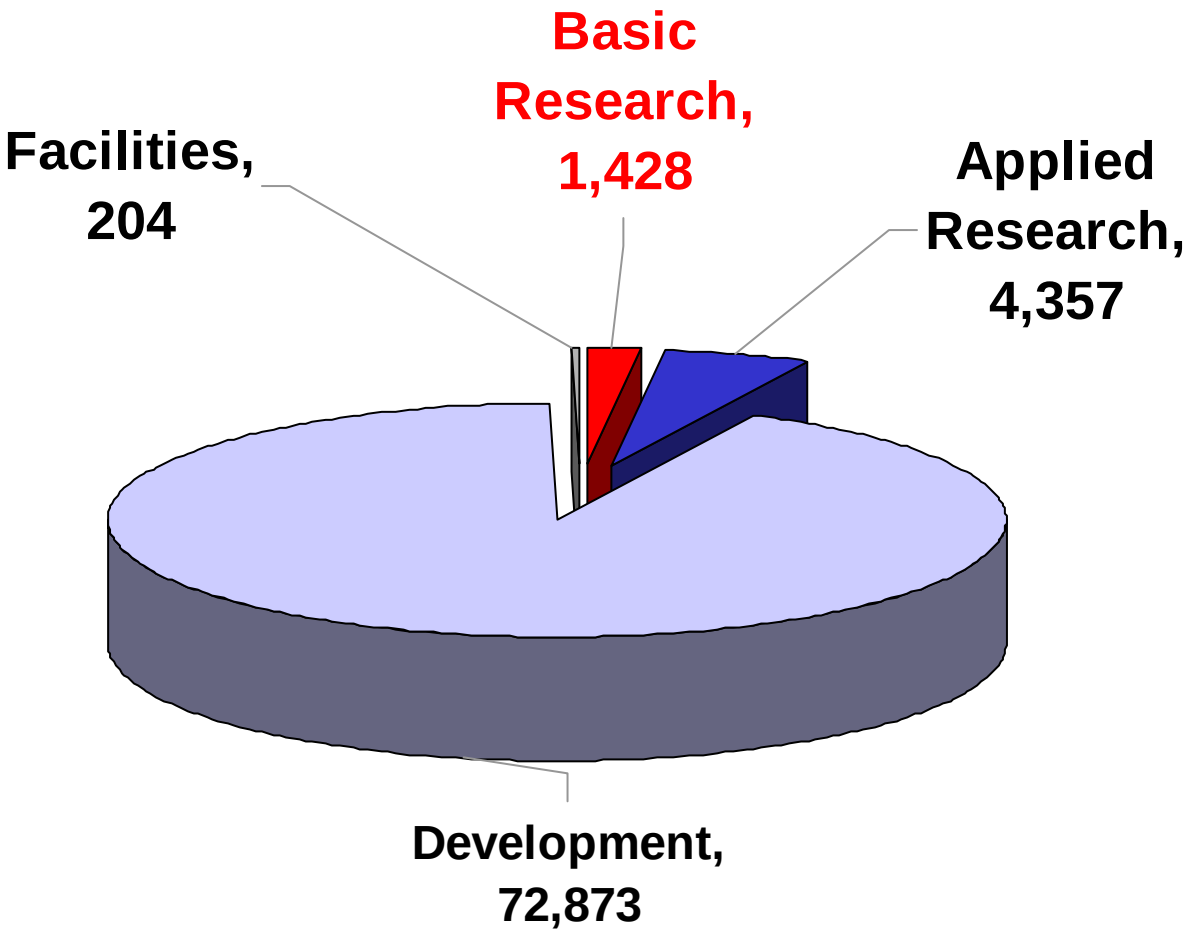


President's FY 2008 Budget showing all Federally funded Research and Development

Source: Federal Budget FY 2008 Analytical perspective, pg 51+ available at http://www.whitehouse.gov/omb/budget/fy2008/pdf/apers/crosscutting.pdf

DoD Research, Development, Test & Evaluation FY 2008

$M



FY08 RDT&E request = $78.86B
(Budget Activities 1→7)

Source: Federal Budget FY 2008 Analytical perspective, pg 51+ available at http://www.whitehouse.gov/omb/budget/fy2008/pdf/apers/crosscutting.pdf

Main Purposes for Defense Basic Research

- Generate new knowledge and understanding as foundation for future defense technologies
- Train scientists and engineers in key disciplines for defense needs
- Sustain research infrastructure needed for continued performance of cutting-edge defense programs

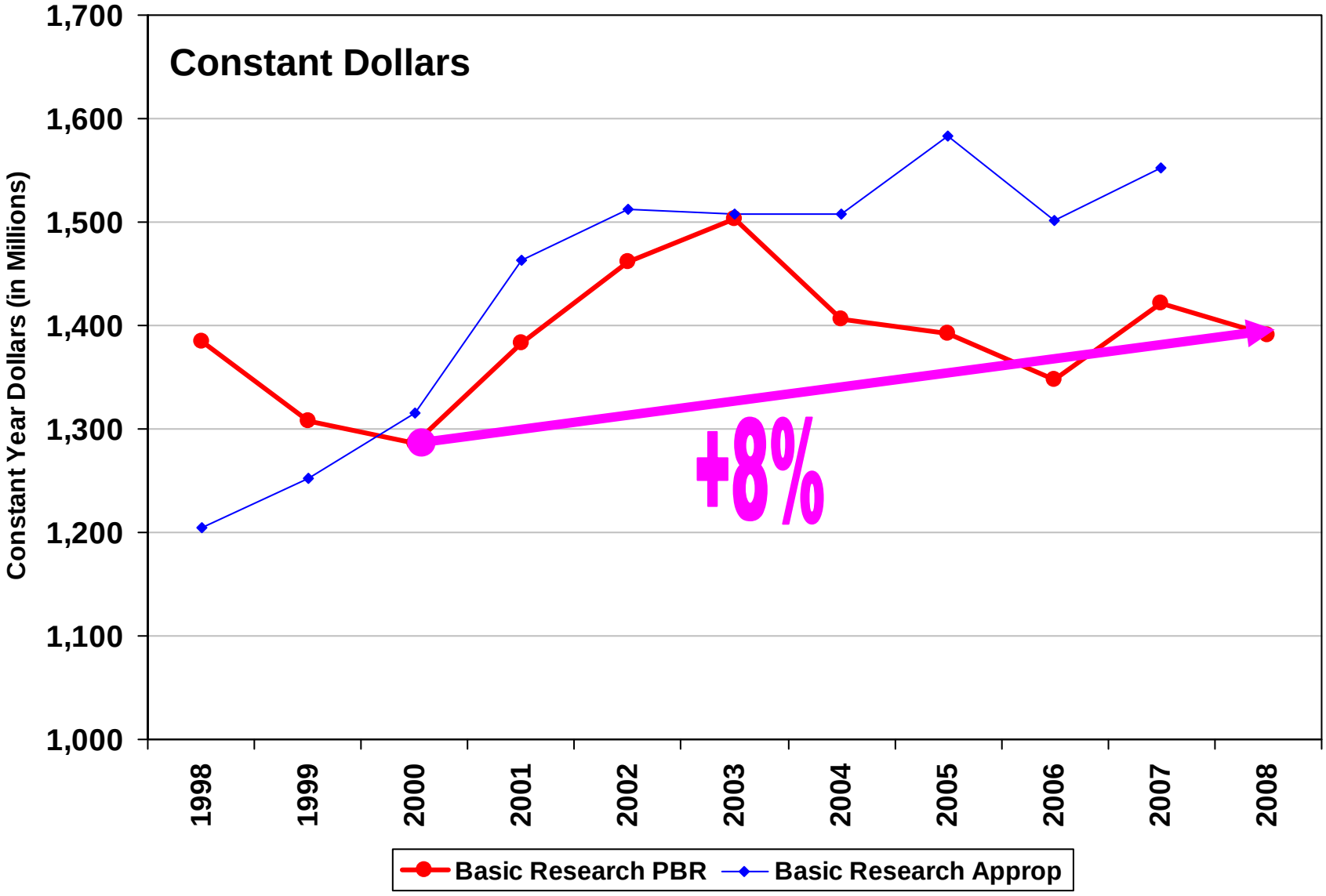
Overall S&T Priorities for FY08

Addresses Quadrennial Defense Review & Strategic Planning Guidance Capability Needs

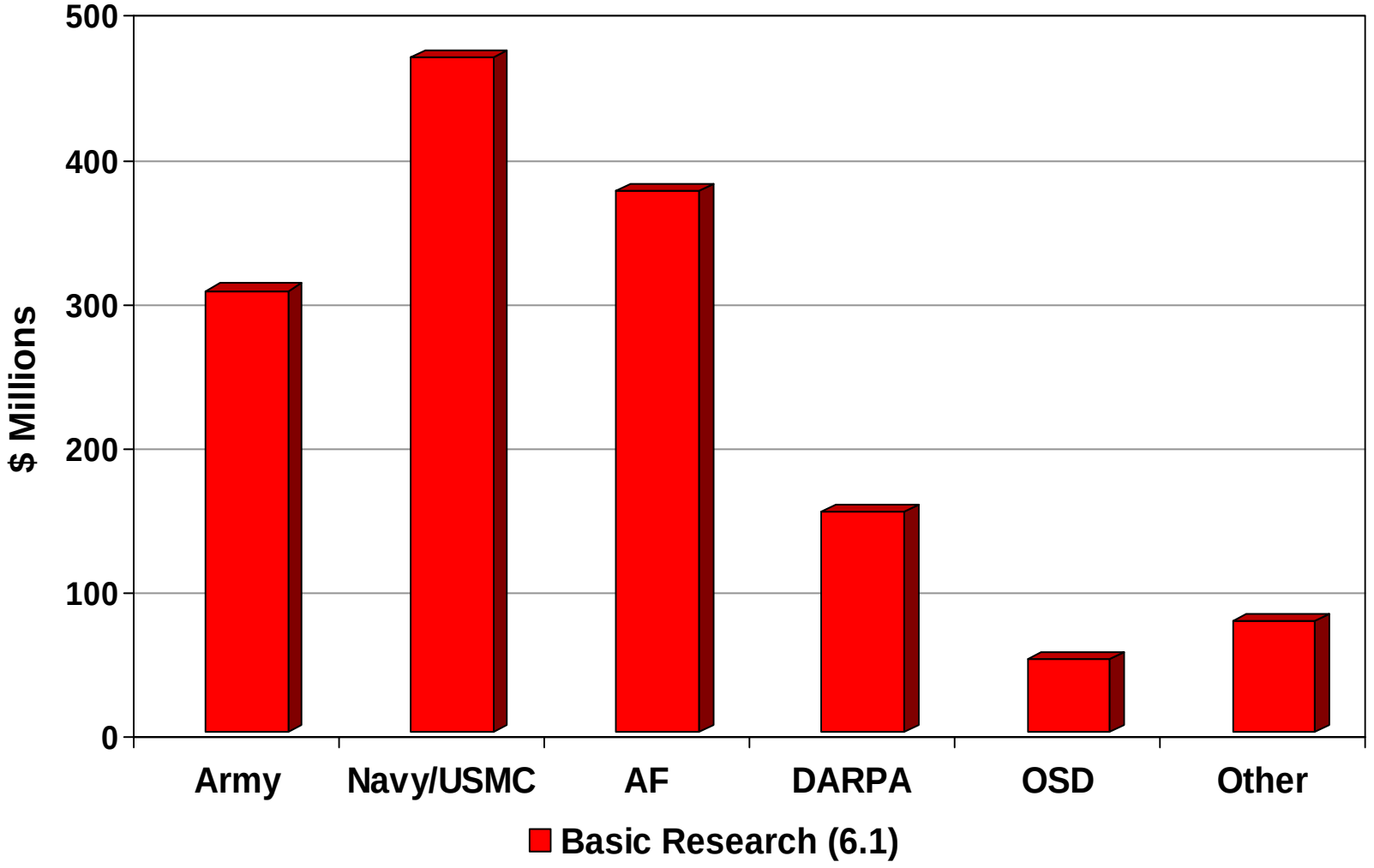
- **Capabilities to Defeat Terrorist Networks**
  - Biometrics
  - Human, Social, Cultural, and Behavioral Modeling
  - Clandestine Tagging, Tracking, and Locating
  - Airborne Hyperspectral
  - Synthetic Aperture Radar Change Detection
- **Capabilities to Defend the Homeland in Depth**
  - Joint Integrated Fire Control
  - Airborne Network Gateway
  - Network Communications Capabilities
- **Acquisition Affordability**
  - Defense-Wide Manufacturing Science & Technology
  - Insensitive Munitions Advanced Technology
  - Computational Research and Engineering Acquisition Tools and Environments (Project in High Performance Computing)

DoD S&T BASIC Research Funding FY1998-2008

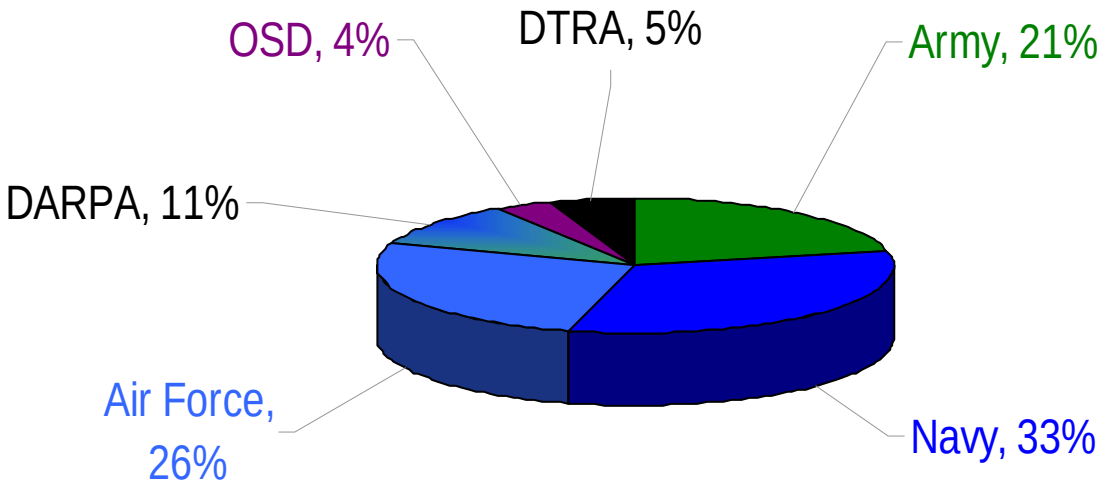
(President's Budget Request & Appropriated)



FY08 DoD 6.1 Budget Request

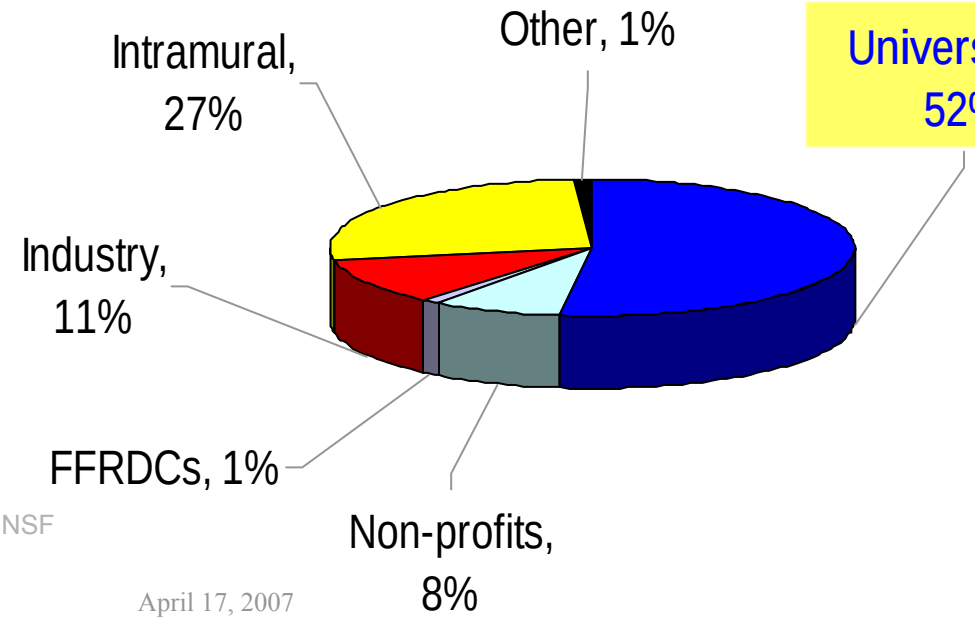


Sources & Destinations of Defense Basic Research Funding



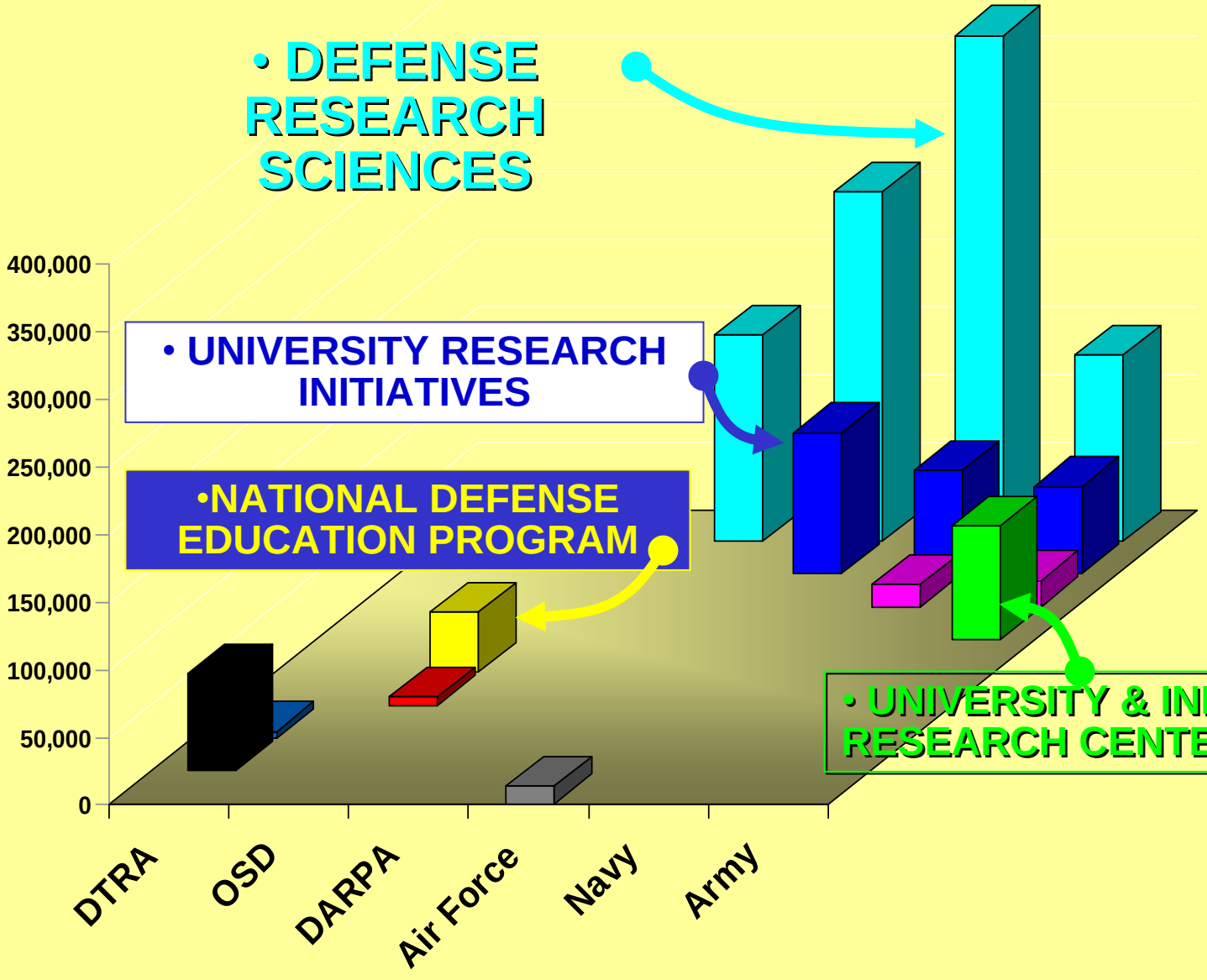
←Source 80% of Defense Basic Research ($1.42B) is Investments by Military Departments

Destination→
Performers of Defense Basic Research - 63% to Universities and Industry



Sources: FY08 President's Budget & DoD component inputs to NSF Federal Funds for R&D survey (FY05 – latest available)

FY08 President's Budget Request for DoD Basic Research



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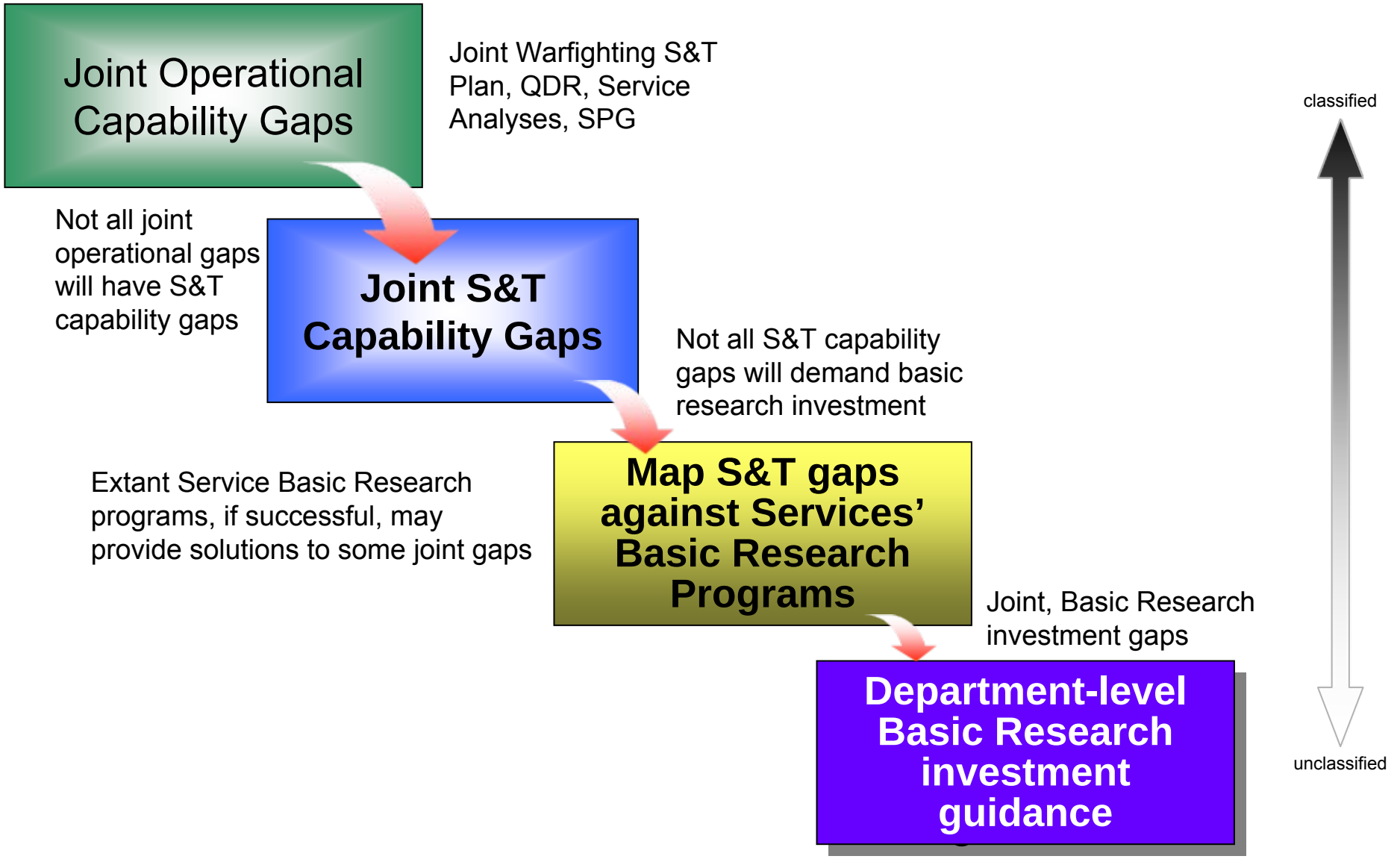
Conceptual Strategic Planning Process



Early-identified Areas of Exploration

Disciplines

- Atmospheric Sciences
- Biological Sciences
- Chemistry
- Cognitive and Neural Sciences
- Electronics
- Forensics
- Health Medicine and Biology
- Materials Science
- Mathematics and computer Sciences
- Modeling and Simulation
- Mechanics
- Physics
- Joint interoperable communications
- Offensive cyber warfare
- Energy efficiency
- Counter-IED

Mission-oriented

- Combating WMD Technologies
- Persistent Surveillance Technologies
- Alternative Fuels & Energy Sources
- Biometrics & Bio-inspired Technologies
- Tagging, Tracking, & Locating
- Directed Energy Technologies
- Anomalous Event Extraction From Massive Data Sets
- Human, Social, Cultural, & Behavioral Predictive Modeling
- Hyperspectral Sensors
- Organization, Fusion, & Selective Extraction of Data
- Manufacturing Technologies
  - Affordability and Producibility
  - Agile Fabrication
- Nanotechnology

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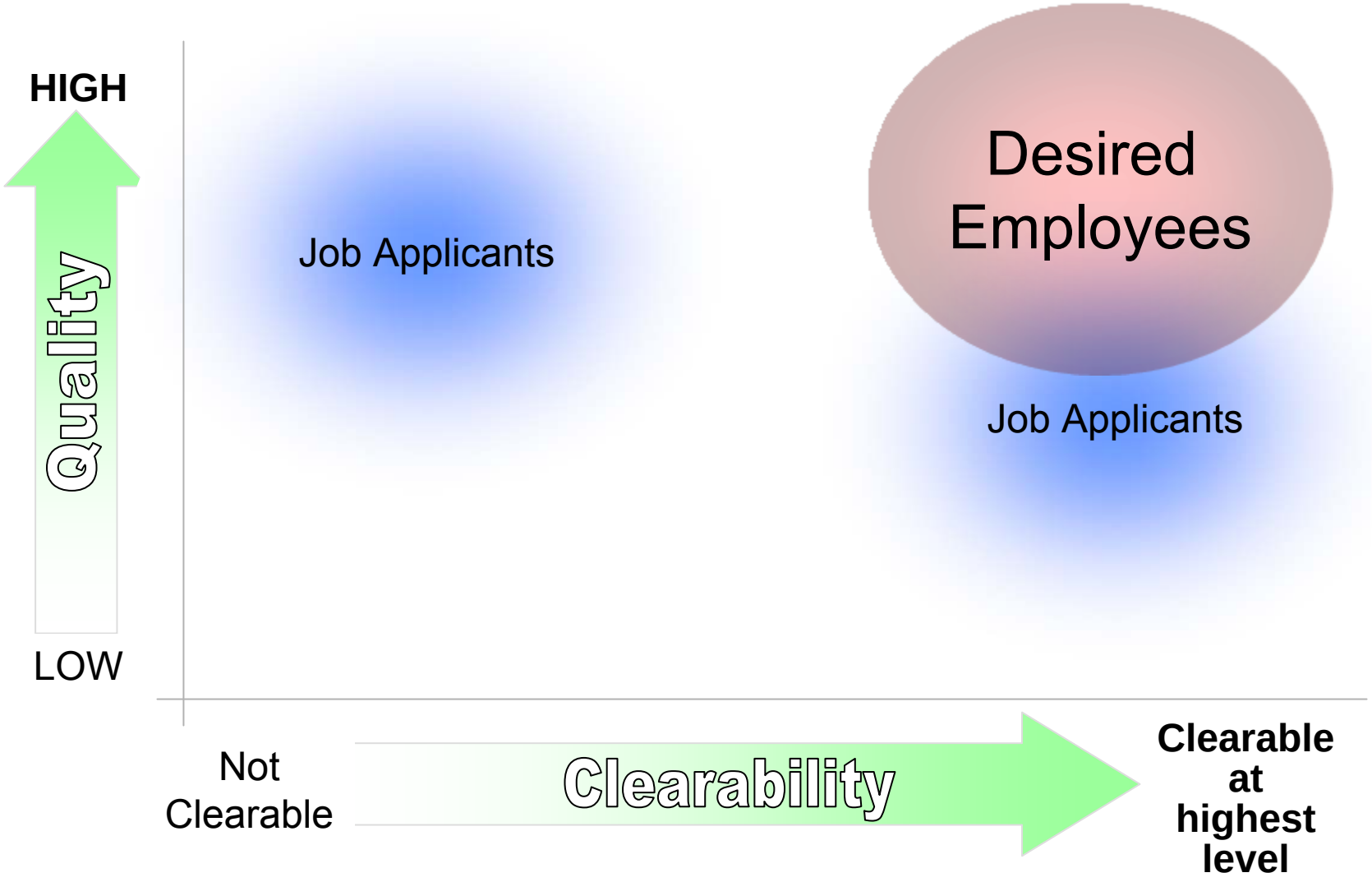
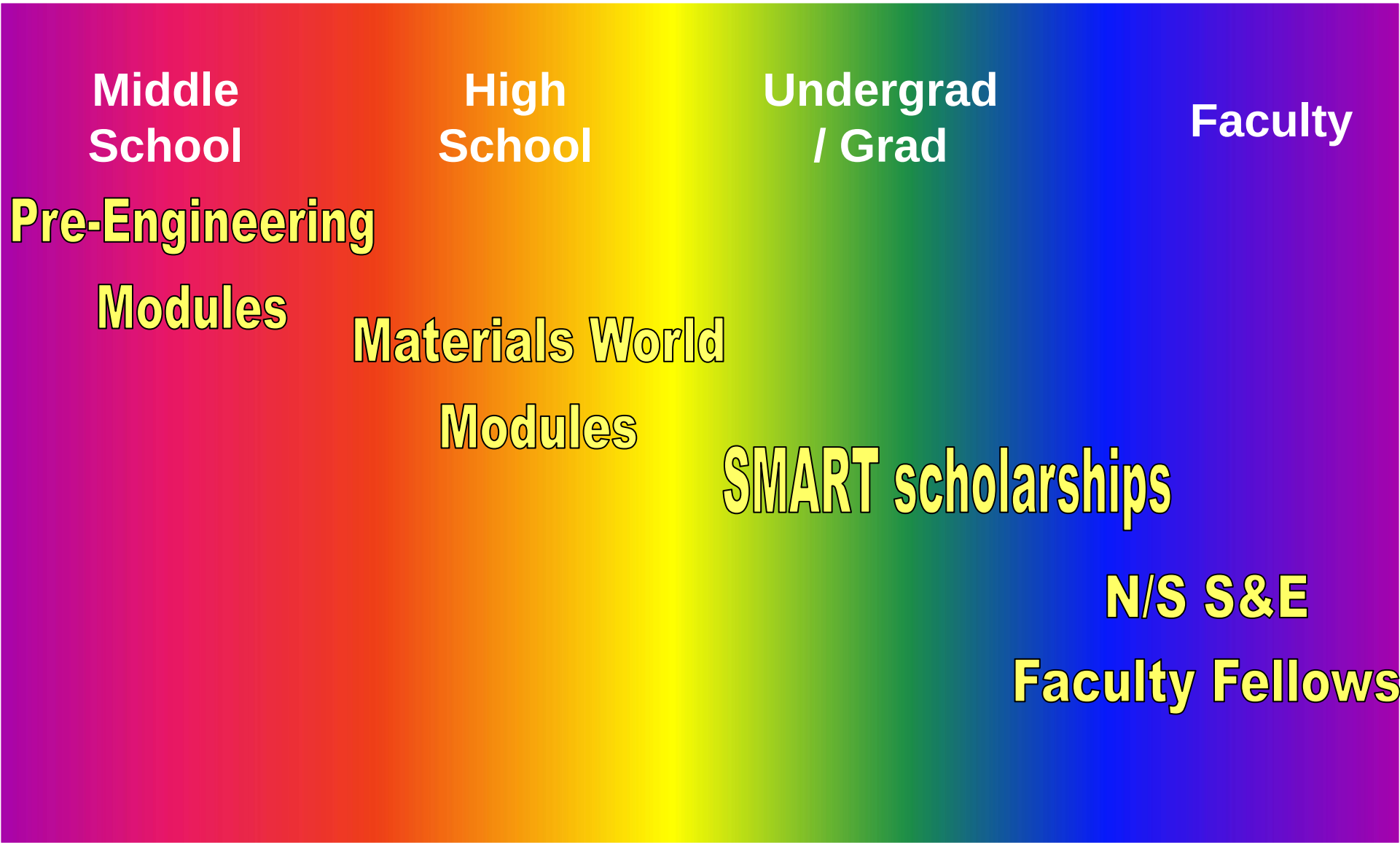
A Unique National Security Problem



Spectrum Of STEM Education



National Defense Education Program

- **Rationale**
- DOD employs nearly half of all Federal physical scientists, mathematicians, and engineers.
- DoD laboratories expect to lose 13,000 scientists and engineers by 2015.
- At the same time, demand for scientists is projected to increase by 17 percent, and for engineers by 22 percent.
- There is a long-term downward trend in defense-relevant science and engineering degrees (at all levels) awarded to personnel who could qualify for the security clearances.
- An April 2004 National Defense University report, The Science and Engineering Workforce and National Security, warns of the rapidly accelerating accumulation of intellectual capital, including an educated Science and Engineering (S&E) workforce, in China, India, Japan, South Korea, and Taiwan. This emphasis is in direct contrast to declining S&E education trends in the US.
- **Payoffs**
- A larger pool of high school graduates academically prepared and interested in physical science and engineering as their intended field of study.
- More clearable, proficient, academically degreed science and engineering workers for future national defense needs.
- In FY08, will have >100 grad (SMART) students, 9 NSSEF Fellows, and a growing K-12 enrichment program.

National Security Science and Engineering Faculty Fellowships

- National Security Science and Engineering Faculty Fellowships (NSSEFF) engages the best clearable, research university faculty to pursue long-term, critical DoD research.
  - A competitive award program that funds 50 top-flight university researchers over the FYDP and adds 10 more each year thereafter. (New Start FY08)
  - Grants are large enough to be attractive ($600K/yr) and long enough (five years) to produce quantifiable research results.
  - Pending Congressional approval, a $5.4M investment in FY08 starts the program with first 9 selectees and increases gradually to steady state of $30M annually in FY13.
  - Biased toward early-career faculty members, though not exclusively for them.
  - All awardees will carry security clearances and will work DoD problems up to the SECRET level.
- NSSEFF captures the best available, clearable university talent to pursue long-term DoD research.

National Defense Education Program (NDEP)

Science Mathematics and Research for Transformation (SMART)

- Comprehensive education and training = Shaped Workforce
- Scholarship/Fellowship (Associate through Ph.D.)
- Security clearable
- Defense Critical Disciplines
- Civil Service Payback required (set at 1 to 1 by policy)
- Employee status while enrolled
- ~40 awards in FY06 (30 in FY05)
- Have & maintain a minimum GPA 3.0 on 4.0 scale
- Post degree follow-up

Science and Engineering Enrichment

- **Materials World Modules (MWM)** supplement existing high school science curricula with hands-on projects. They engage students and teachers in partnership with DoD laboratory scientists and engineers.
  - FY06 Summer Institute
  - Kit-based curriculum enhancement using relevant learning segments (i.e. sports materials, concrete, biosensors, etc.) that combine the inquiry of science with the design of engineering
  - Impact experiment completed, first teacher training session completed
  - In an FY06 effect assessment, students exposed to MWM show 62% cognitive (knowledge) and very significant positive attitudinal gain toward science and engineering, in immediate post-exposure poll.
  - Additional components anticipated in FY07 & FY08

Science and Engineering Enrichment

Pre-Engineering Modules (PEM) are practical, middle school curriculum modules that tie math, physical science, and engineering to real-world applications. (New Start FY08)

- Require multiple tools in the tool kit to reach broad audience with sustained impact
- Invest in projects that are effective and efficient.
- Partner with existing programs as an option

Summary

- Universities perform over half of DoD 6.1
- DoD 6.1 research request has increased 8% since FY2000
- NDEP provides full spectrum of university support
  - Undergraduate students
  - Graduate students

  } **SMART**

  - Faculty → **NSSEFF**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UNITED STATES OF AMERICA