Fiscal Year 2009
President's Budget Request for
Science & Technology
And
Research & Engineering

Principal Deputy
Defense Research and Engineering

Report Documentation Page

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DDR&E Vision

VISION: To develop technology to defeat any adversary on any battlefield

Any Battlefield includes physical, cyber, space, undersea, etc

Any Adversary includes both State and non-State actors

Building the Science and Engineering Base

- We need to continually develop, mature and field technology to stay ahead of our adversaries
- President Bush acknowledged the importance of science and engineering development in his January 2008 State of the Union address

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow… I ask Congress to double federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth.."

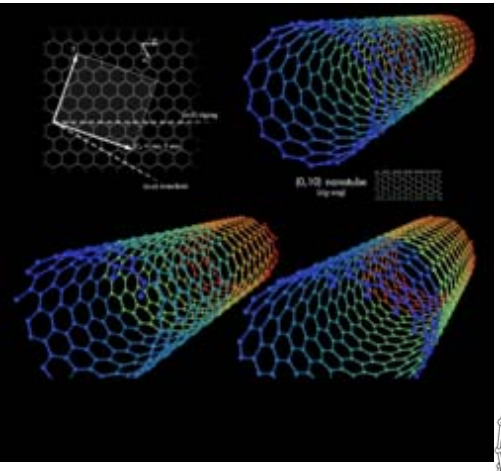
President George W. Bush, State of the Union address, January 28, 2008

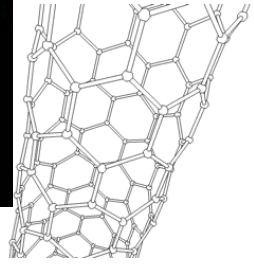
"As changes in this century's threat environment create strategic challenges – irregular warfare, weapons of mass destruction, disruptive technologies – this request places greater emphasis on basic research, which in recent years has not kept pace with other parts of the budget."

Secretary of Defense Posture Statement on the FY09 Budget, February 2008

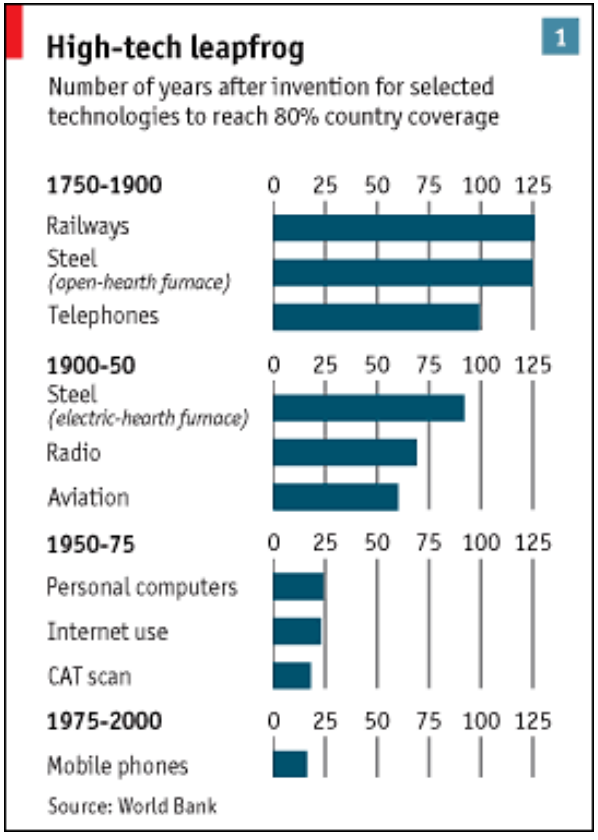
Pace of Technology Continues to Increase

- **Time between modeling of semiconducting properties of germanium in 1931 and first commercial product *(transistor radio)* was 23 years**
- **Carbon nanotube**
  - **Discovered by Japan (1991)**
  - **Researchers recognized carbon nanotubes were excellent sources of field-emitted electrons (1995)**
  - **"Jumbotron lamp" - nanotube-based light source available as commercial product (2000)**





Nanotechnology – Rapid Technology Evolution/Application Cycle



Source: The Economist, Feb. 9, 2008

Overview

- **PBR09 R&E budget**
- **Budget changes and historical context**
- **Strategic foundation**
  - **Quadrennial Defense Review**
  - **Director, Defense Research and Engineering Priorities**
- **DDR&E interest items**
- **OSD / DDR&E programs**

PBR09—Continued growth of "non-kinetic", non-platform specific capabilities

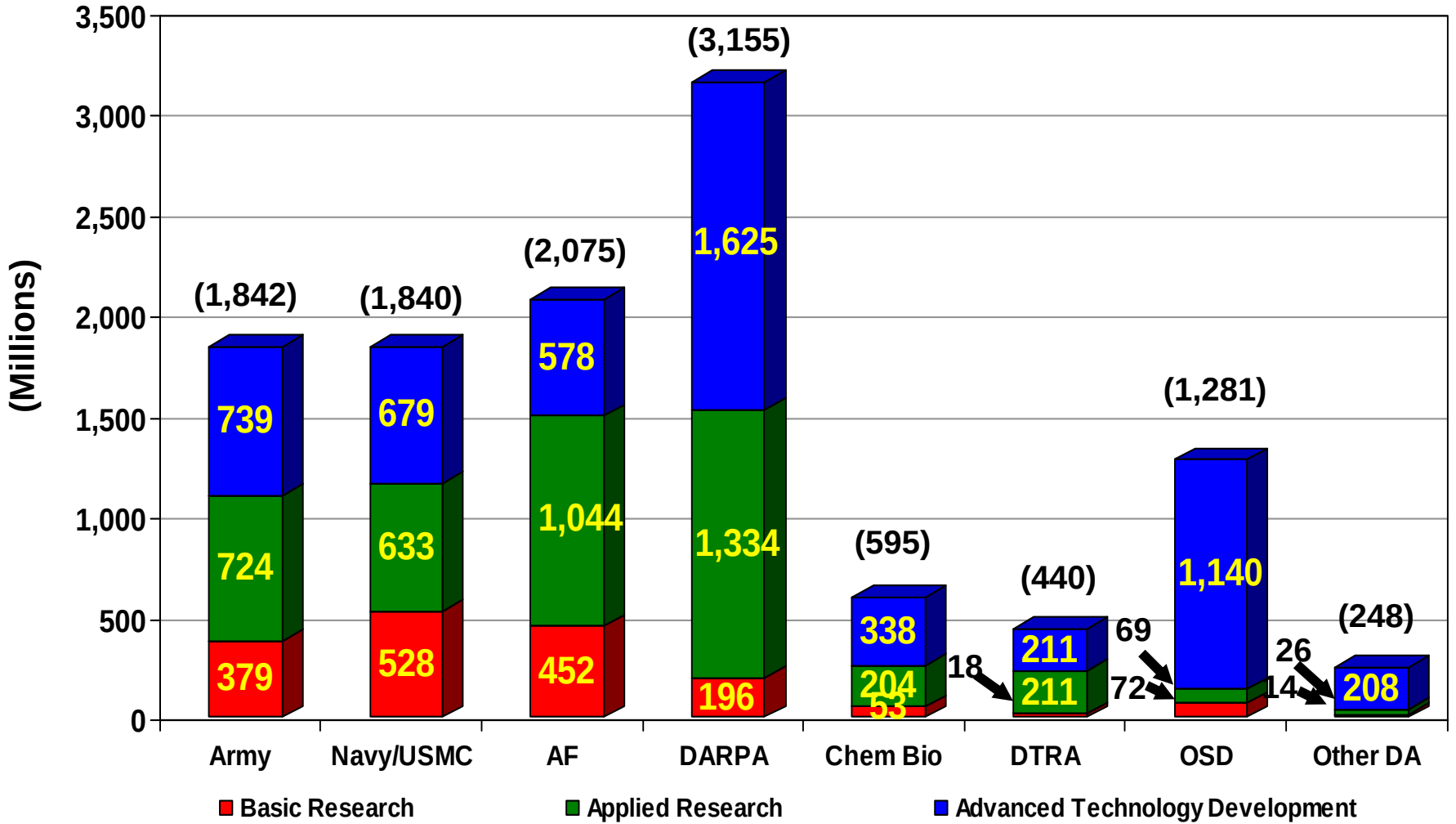
PBR09 R&E Budget

FY09 DoD S&T Budget Request

Total FY09 S&T request = $11.48B

Total FY08 S&T Request = 10.77B

Army = 1,728 Navy = 1,667 AF = 1,964 DARPA = 3,033 ChemBio = 610 DTRA = 401 OSD = 1,166 Other DA = 201



FY09 DoD R&E Budget Request Comparison

	FY08 PBR	FY08 Approp	FY09 PBR *(Constant Year FY08)*	Real Change from PBR (In CY $)
Basic Research (BA 1)	1,428	1,634**	1,699 *(1,662)*	+16.4%
Applied Research (BA 2)	4,357	5,092	4,245 *(4,153)*	-4.7%
Advanced Technology Development (BA 3)	4,987	6,043	5,532 *(5,412)*	+8.5%
DoD S&T	**10,772**	**12,768**	**11,475 *(11,227)***	**+4.2%**
Advanced Component Development and Prototypes (BA 4)	15,662	15,947	15,774 *(15,431)*	-1.5%
DoD R&E (BAs 1 – 4)	**26,434**	**28,716**	**27,249 *(26,657)***	**+0.9%**
DoD Topline	**481,554**	**569,000**	**515,400 *(502,486)***	**+4.3%**

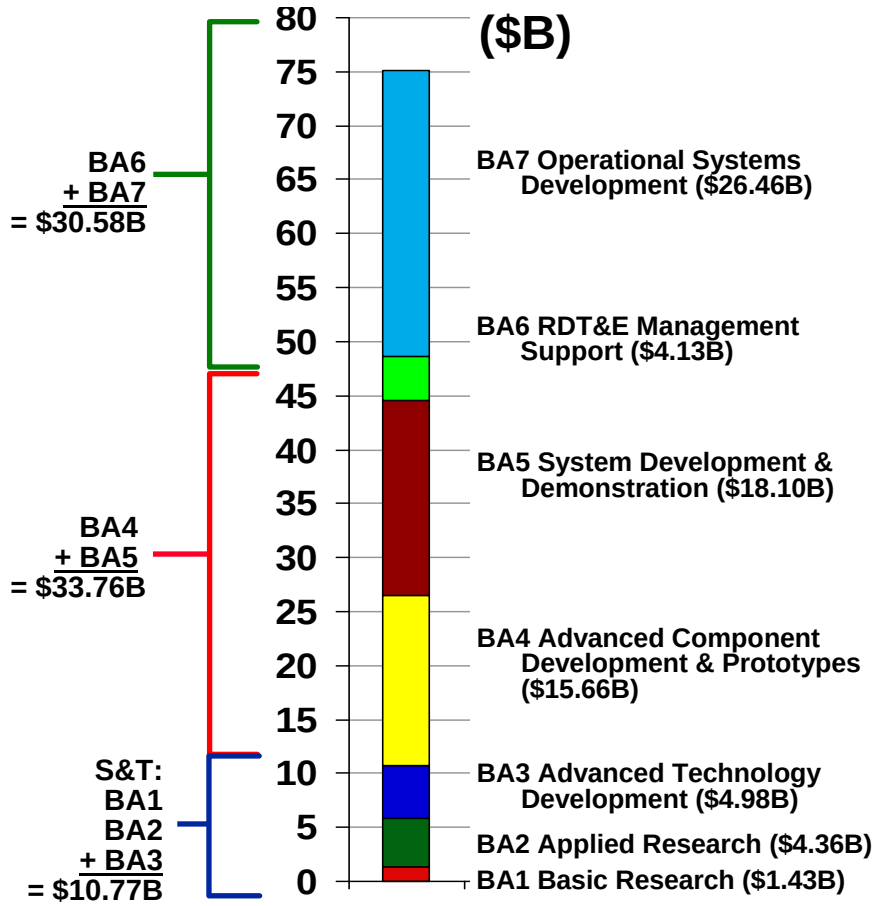
Note: *The PBR09 budget documentation miscoded the Air Force Tanker Replacement program as BA 1 vice BA 7, misstating the BA 1 total to be $1,784M. $1,634 is the correct amount.*

FY09 President's Budget Request is increasing the technology base

FY08 and FY09 RDT&E Budget Request Comparison

- in Then Year Dollars -

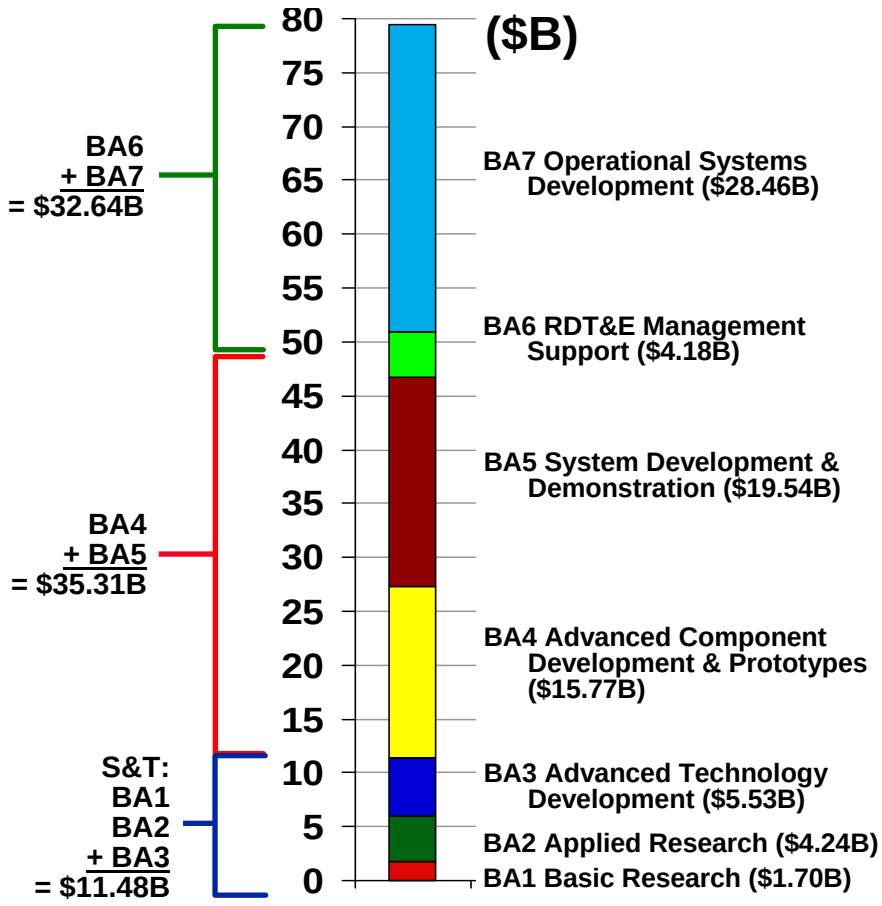
FY08 RDT&E request = $75.12B
(Budget Activities 1-7)



Technology Base (BA1 +BA2) = $5.78B

PBR08 S&T is 14.3% of RDT&E

FY09 RDT&E request = $79.43B
(Budget Activities 1-7)

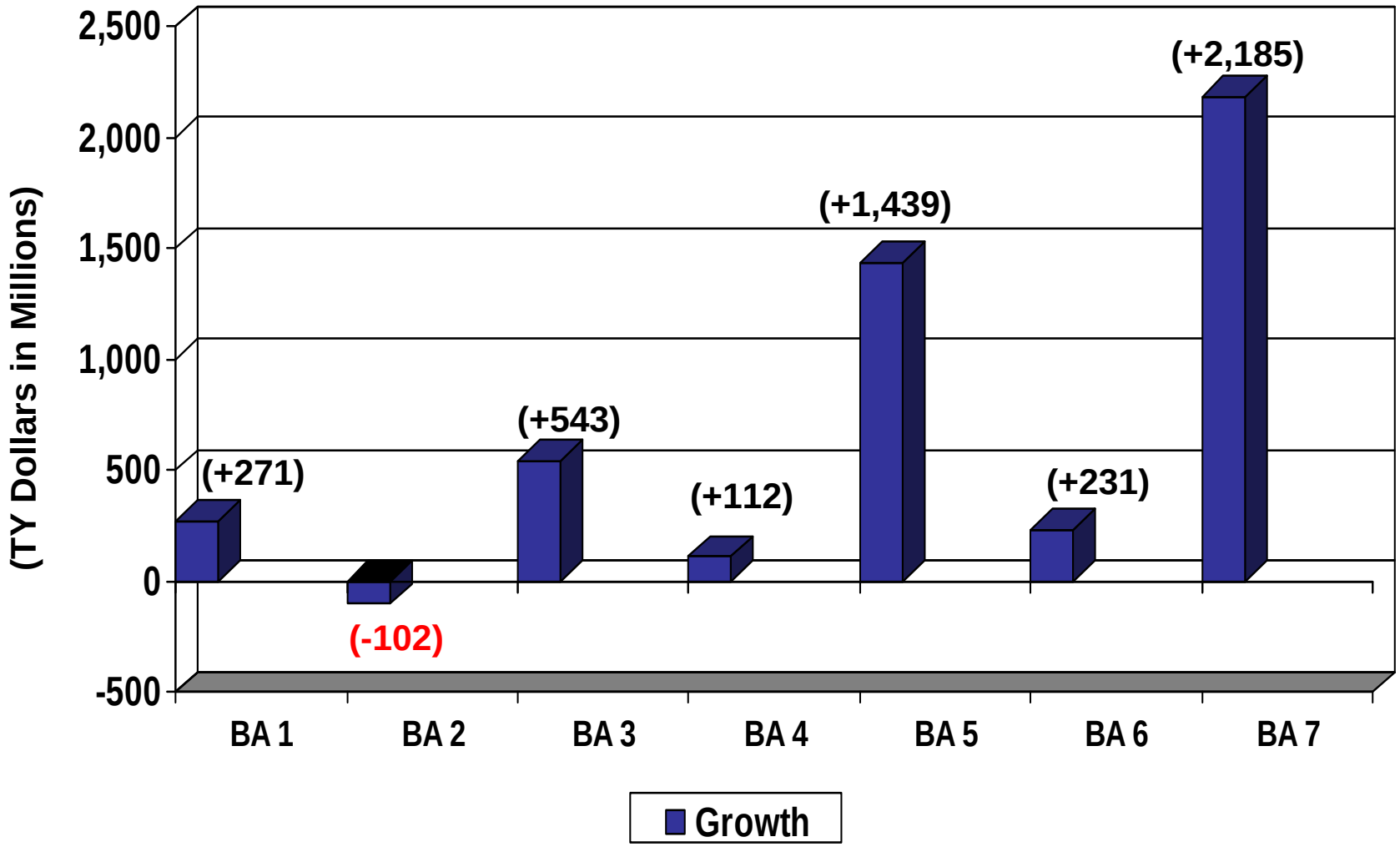


Technology Base (BA1 + BA2) = $5.94B

PBR09 S&T is 14.5% of RDT&E

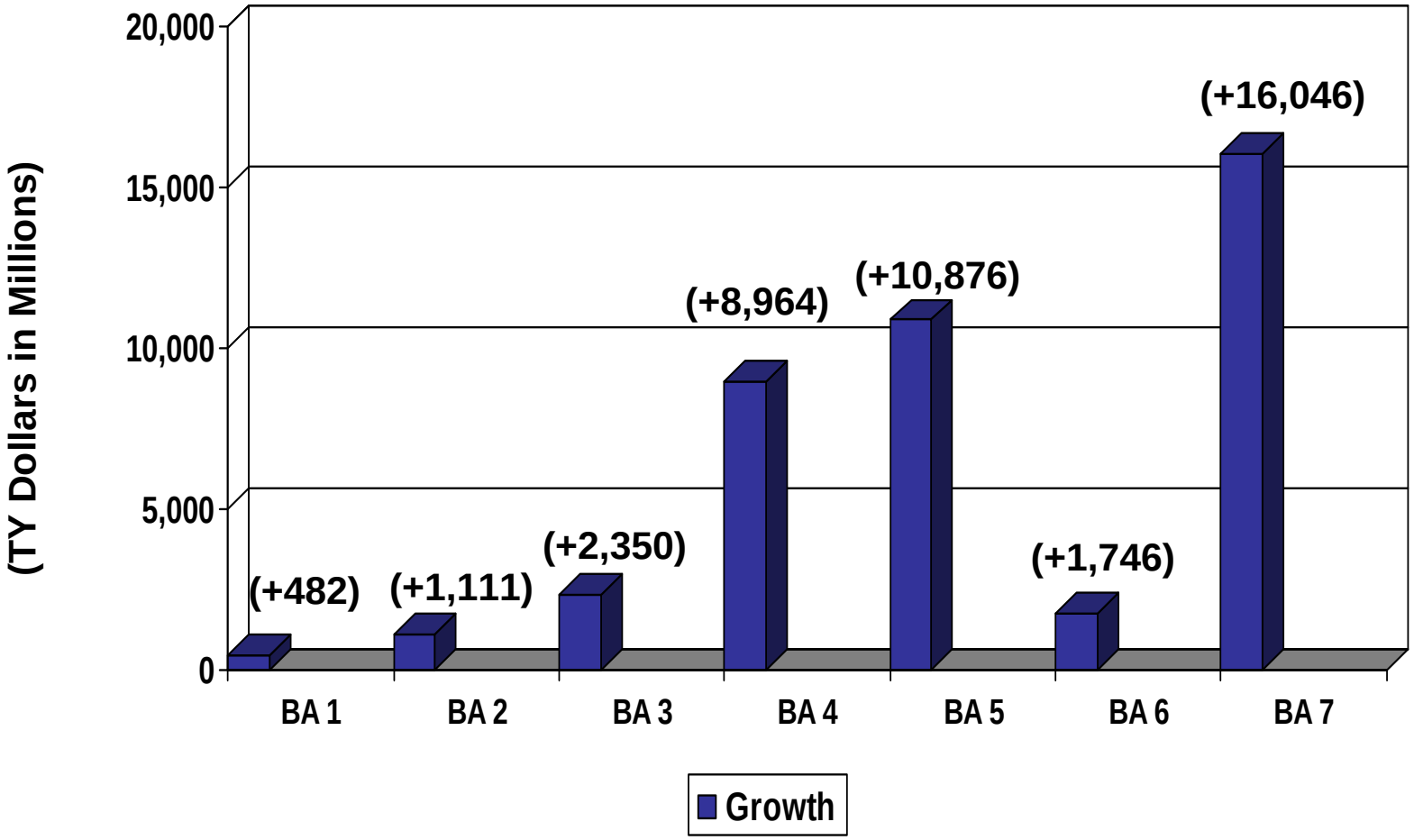
RDT&E Budget Request Growth

- FY08 and FY09 Comparison -



RDT&E Budget Request Growth

- FY01 and FY09 Comparison -



Budget Changes and Historical Context

PBR09 S&T Request Addresses Capability Gaps

- PBR09 S&T Request continues the realignment initiated in FY08 to address capability gaps identified in the 2006 QDR
  - Special ("non-kinetic"/enabling) technologies:
    - Clandestine Tagging, Tracking and Locating
    - Biometrics
    - Human, Cultural, Social Behavior Modeling
    - Networks
    - Persistent Surveillance
  - Technologies to decrease energy consumption/increase alternatives
  - Combat and tactical armor for protection against a range of threats
  - Accelerating transition to fielded systems

Investment shifted away from platform-specific technologies

PBR09 S&T Request Addresses Capability Gaps *(Cont'd)*

- New technology/emphasis areas
  - $270M increase to Basic Research
    - SecDef initiative to increase peer-reviewed basic research
      - To develop innovative solutions
      - Enhance the science and engineering personnel base
    - Increase will support targeted focus areas for
      - Early to mid-career scientists and engineers with a team of students and post docs
      - Single Investigator awards with larger grants
    - Emphasis will be on emerging technology areas, e.g.,
      - Cyber protection and information assurance
      - Biosensors and biometrics
      - Human sciences (cultural, cognitive, behavioral, neural)
      - Software sciences and materials
      - Immersive sciences for training and mission rehearsal
      - Power and energy management
    - Anticipate about 500 focused research efforts

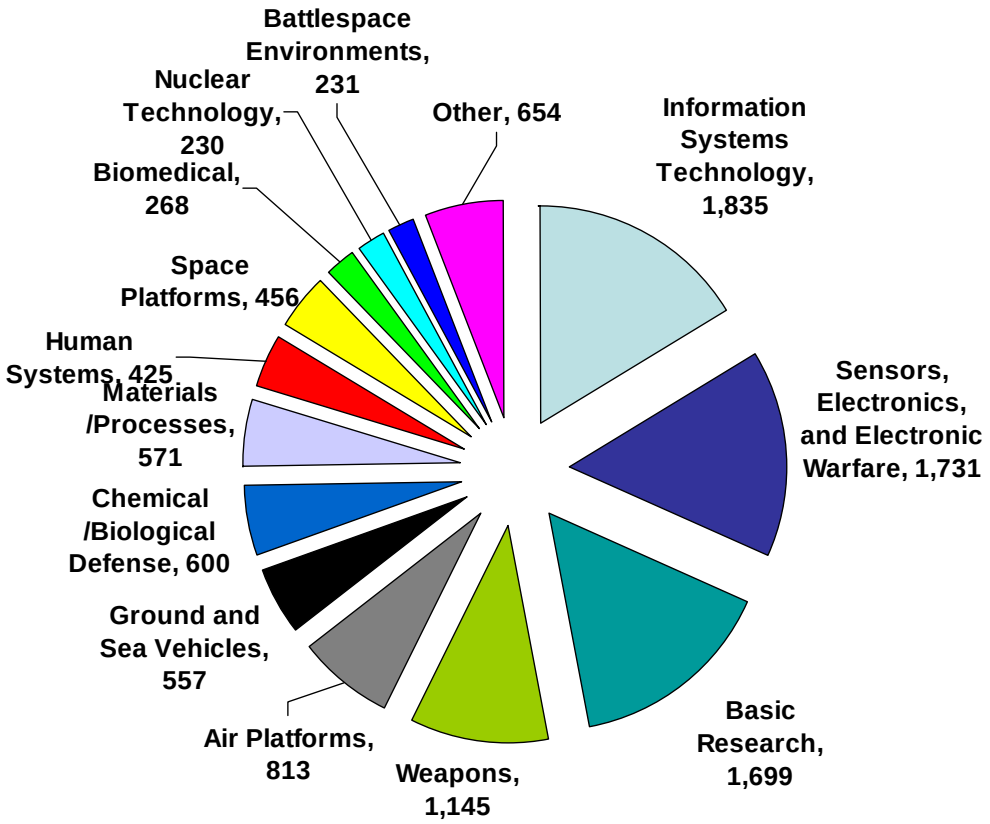
PBR09 S&T Request Addresses Capability Gaps *(Cont'd)*

- New technology/emphasis areas *(Cont'd)*
  - Increased protection for dismounted troops and ground forces
  - Research in plasma and meta-materials to address emerging threats
  - Cyber protection **
  - Hypersonics/Prompt Global Strike (Blackswift) – New technology prototype **

** ***Note****: Cyber protection is funded in DARPA BA 6*
Air Force funding for Blackswift is in BA 7

Characterization of the FY09 DoD S&T Program

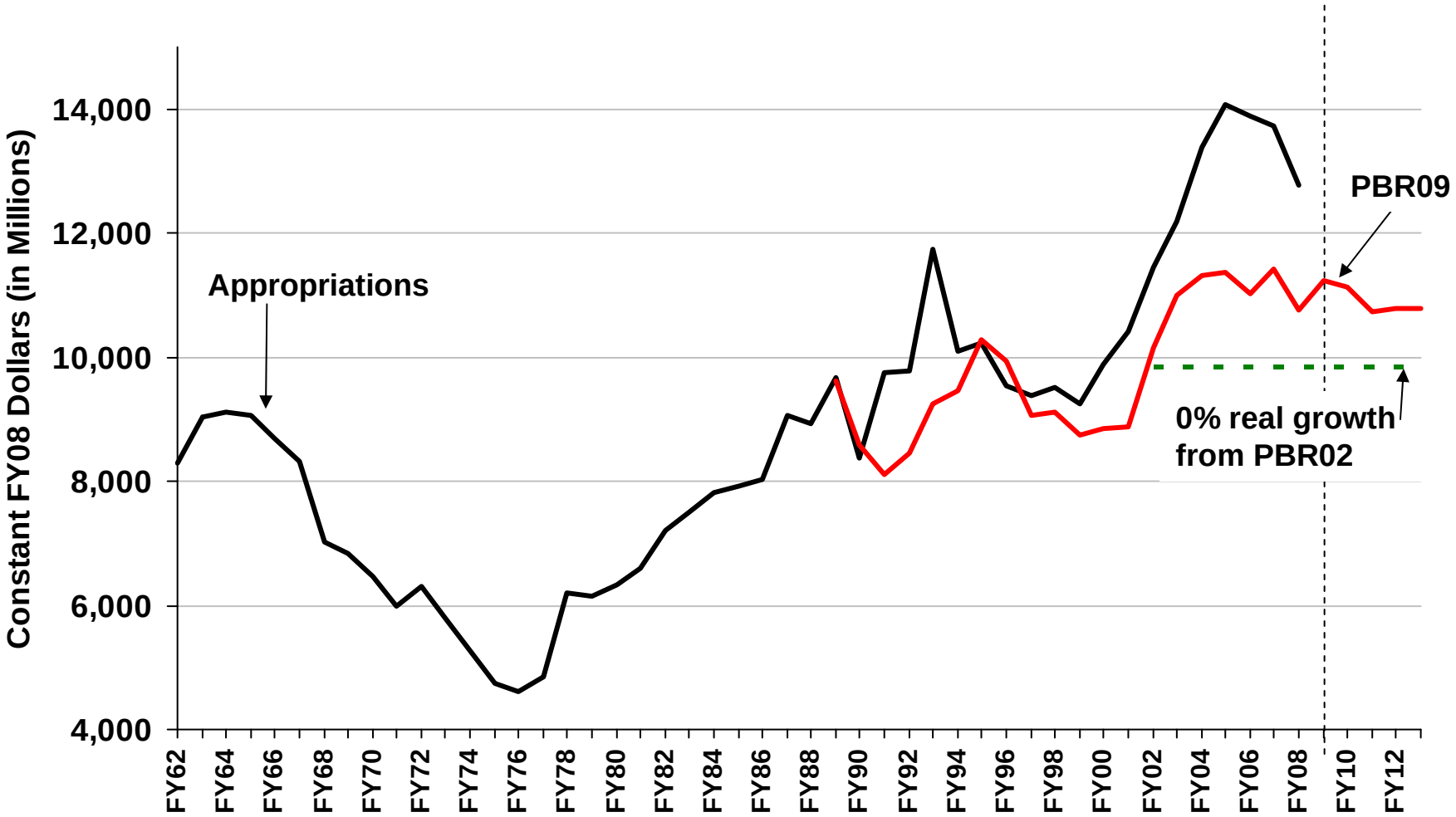
- **Funding**
  - Current year S&T dollars: $10.77B FY08 to $11.48B FY09
  - Percent of DoD funding: 2.24% FY08 to 2.22% FY09
  - Over 50% of total investment in 4 functional areas:
    - Information Systems (1.8B)
    - Sensors, Electronics / EW (1.7B)
    - Basic Research (1.7B)
    - Weapons (1.1B)



DoD S&T program is focused on "sensing and shooting"

DoD S&T – Historical Context

- In FY08 Constant Dollars -

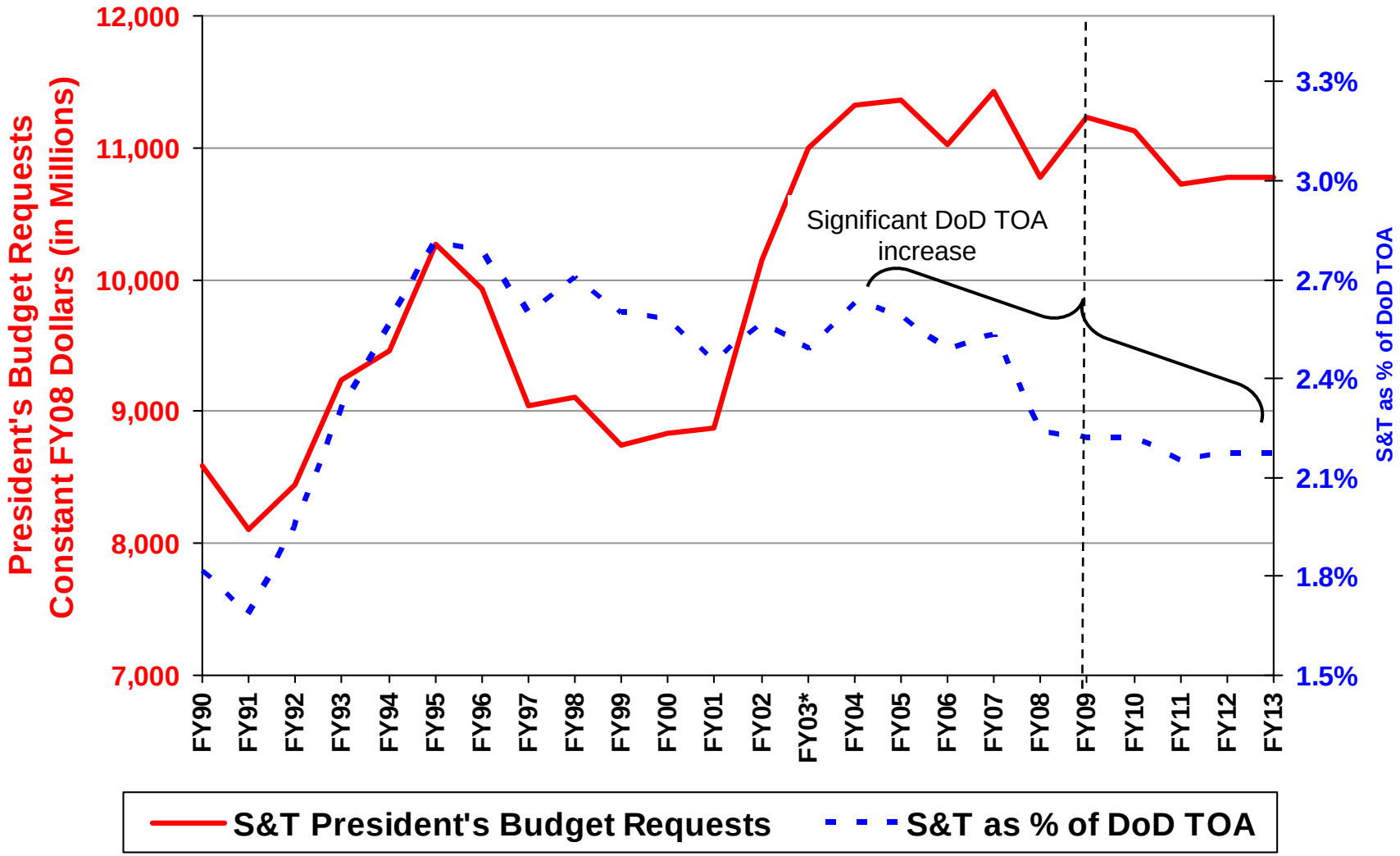


In FY03, includes $203M allocated to Def Emergency Response Fund (DERF) S&T in a separate DoD transfer account

FY09 S&T request is among the highest

DoD S&T - Macro Scale

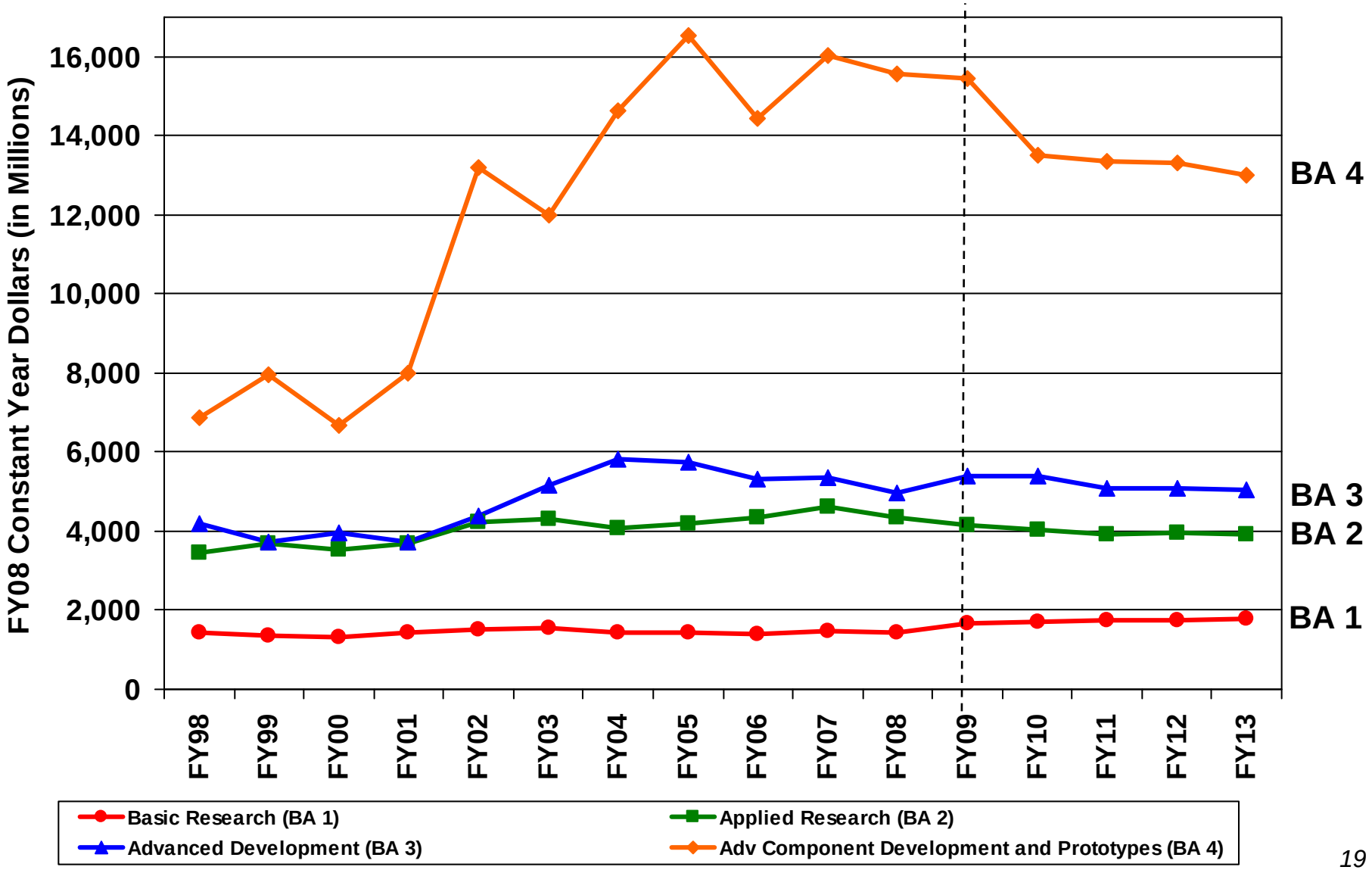
- S&T Investment and % of DoD Total Obligational Authority (TOA) -



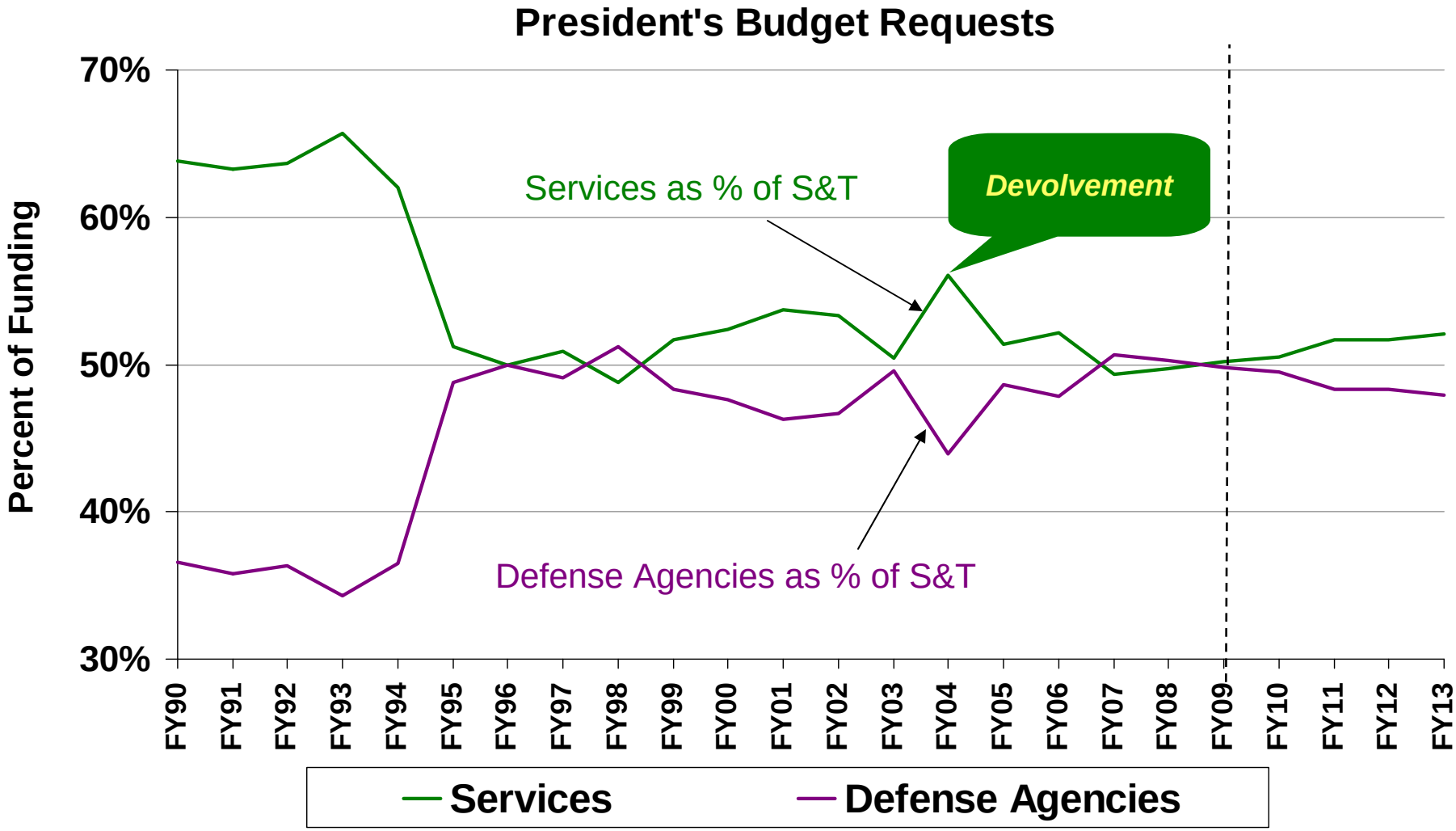
** ***Note:*** FY03 includes DERF & Nuclear Posture Review funding

DoD R&E Funding By Budget Activity

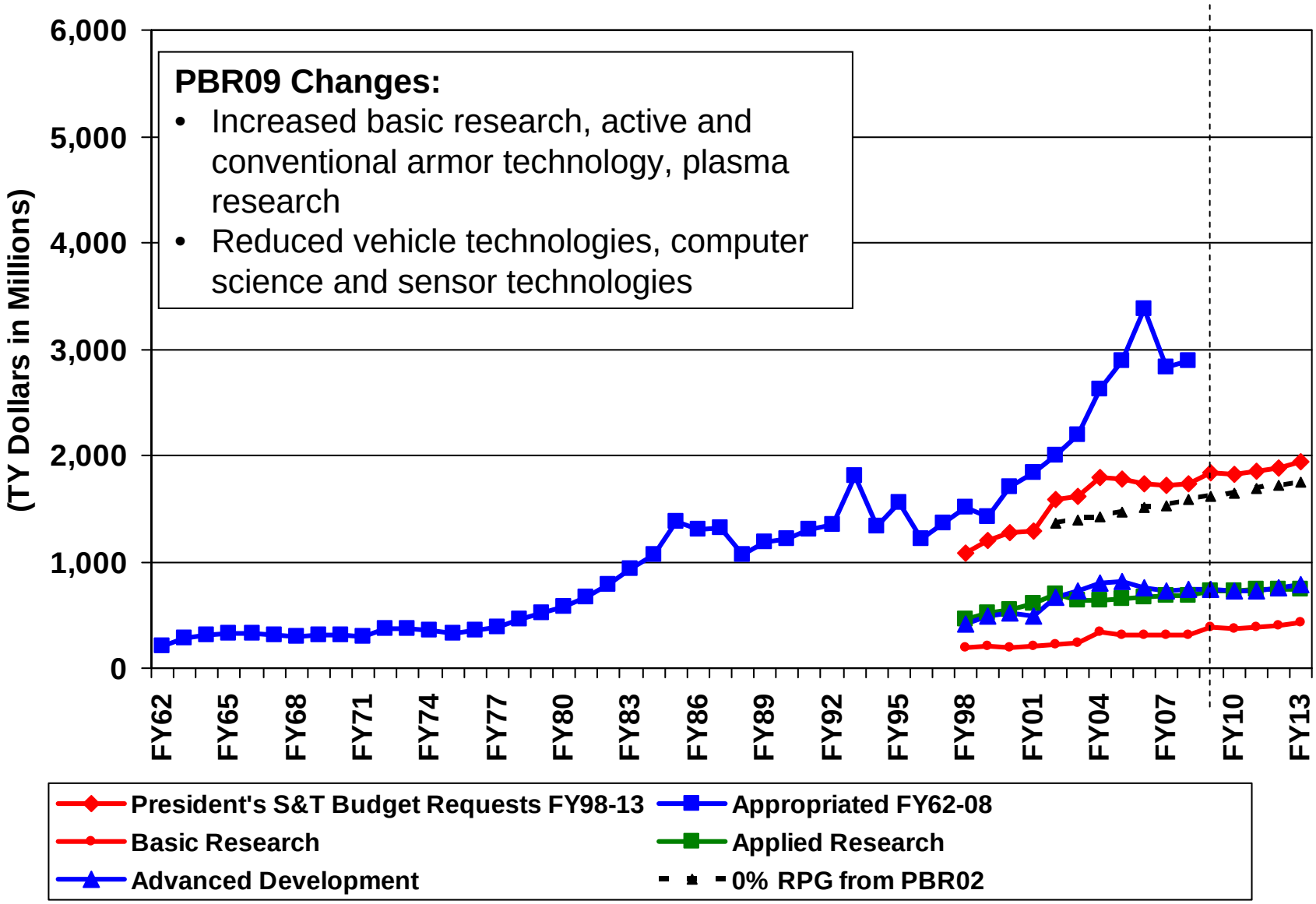
- President's Budget Requests (in FY08 Constant Dollars) -



S&T Breakout
- Services and Defense Agencies as % of Total S&T -

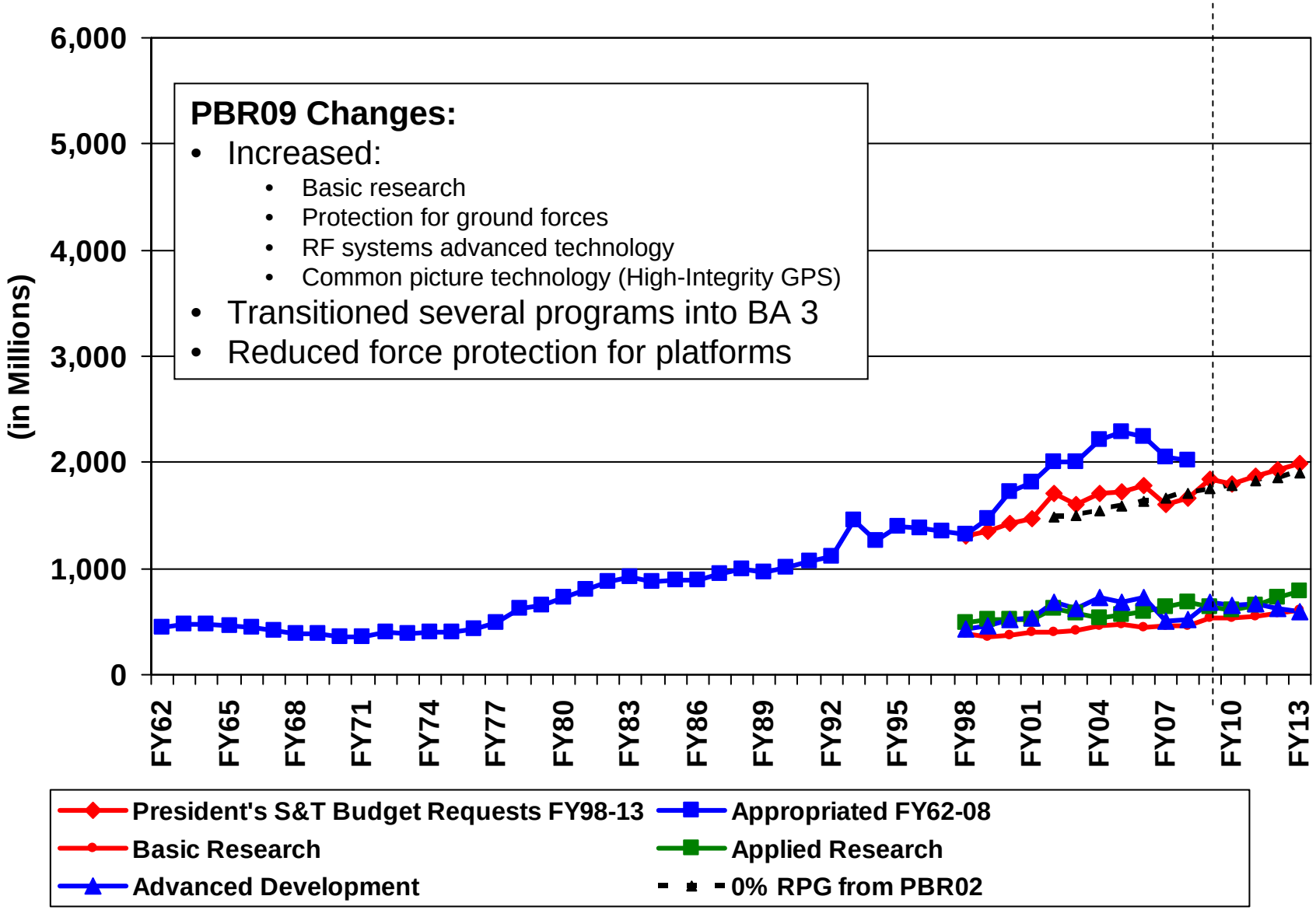


Army S&T Funding
- in Then Year Dollars -



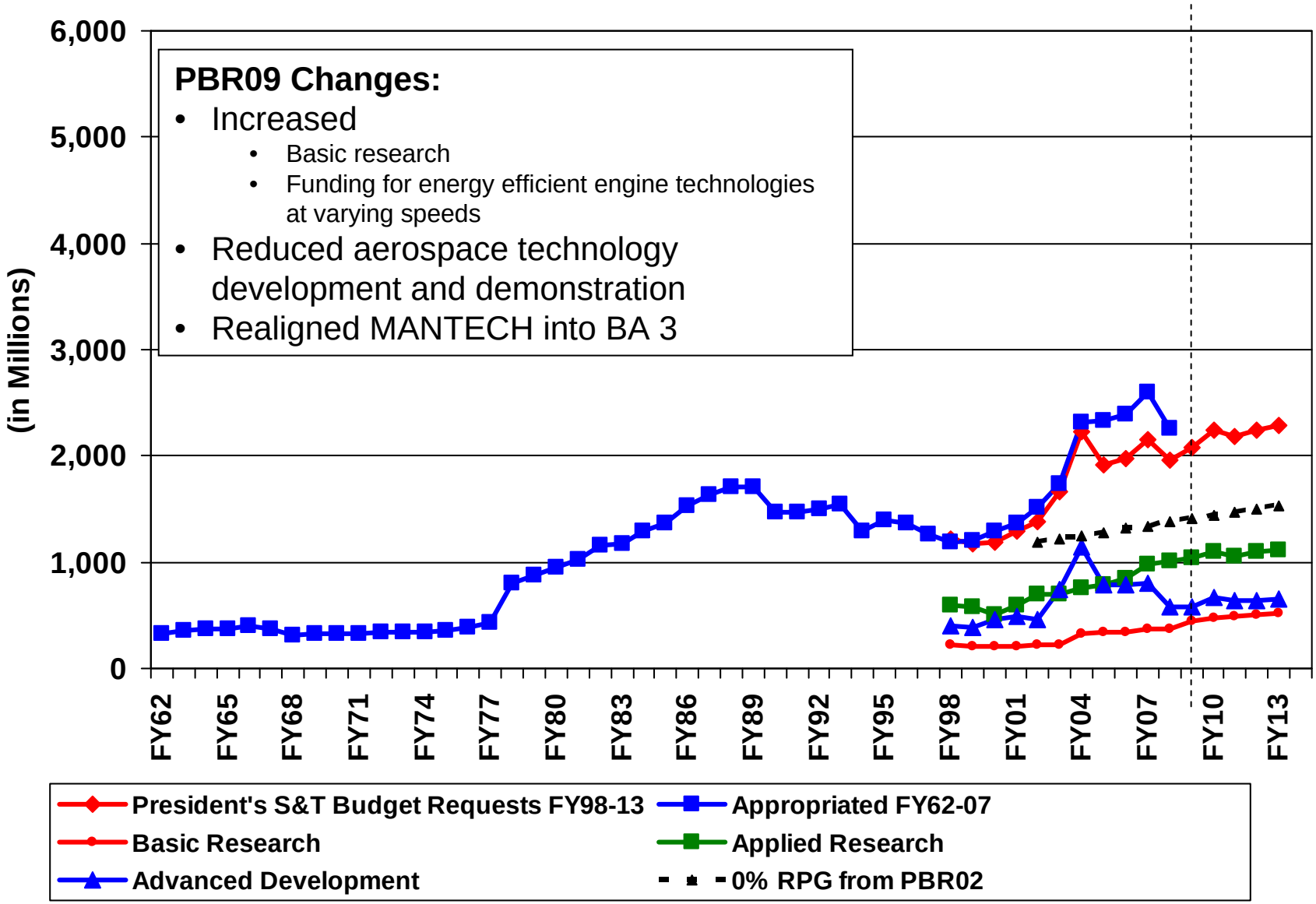
Department of Navy S&T Funding

- in Then Year Dollars -



Air Force S&T Funding

- in Then Year Dollars -

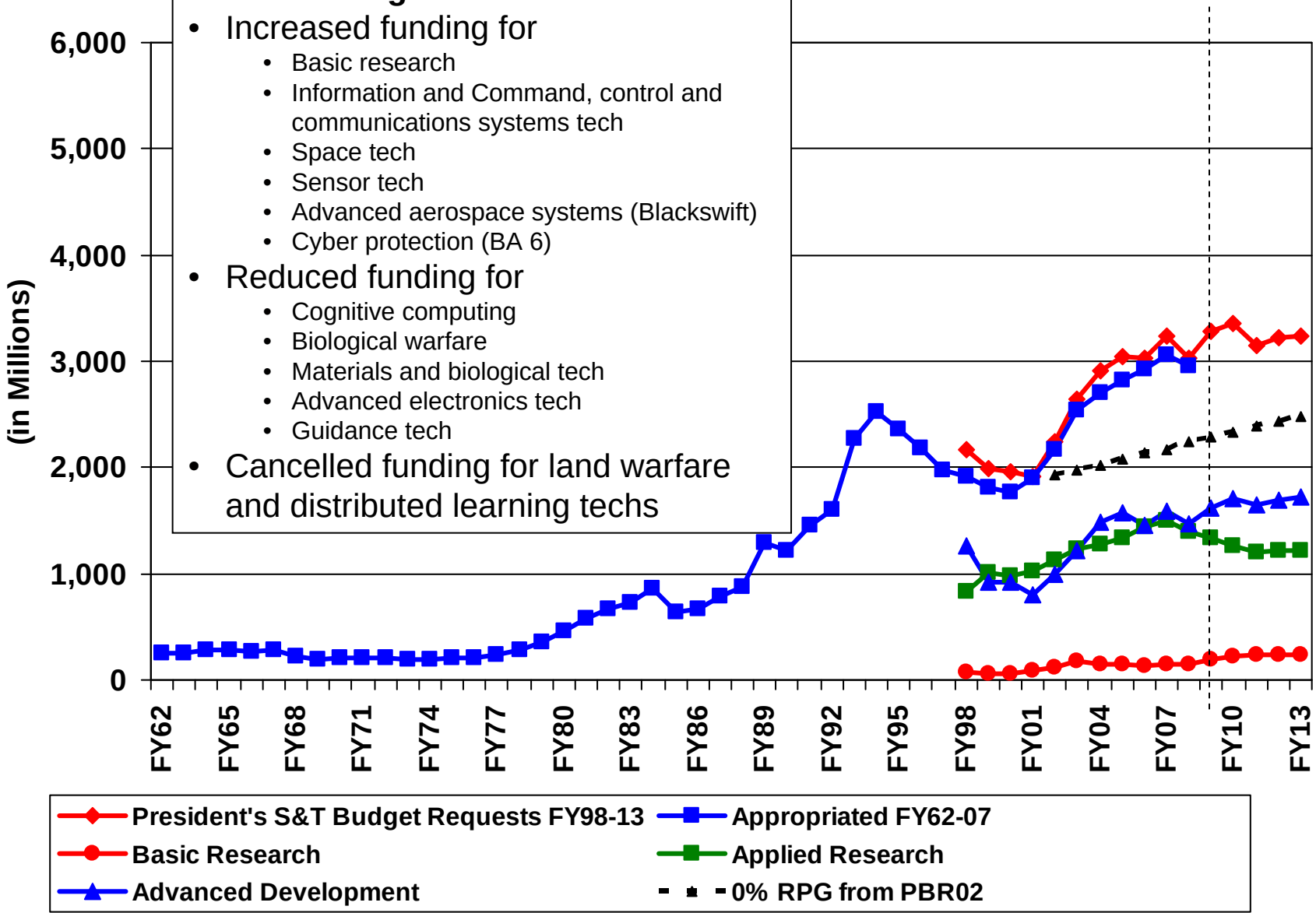


DARPA S&T Funding

- in Then Year Dollars -

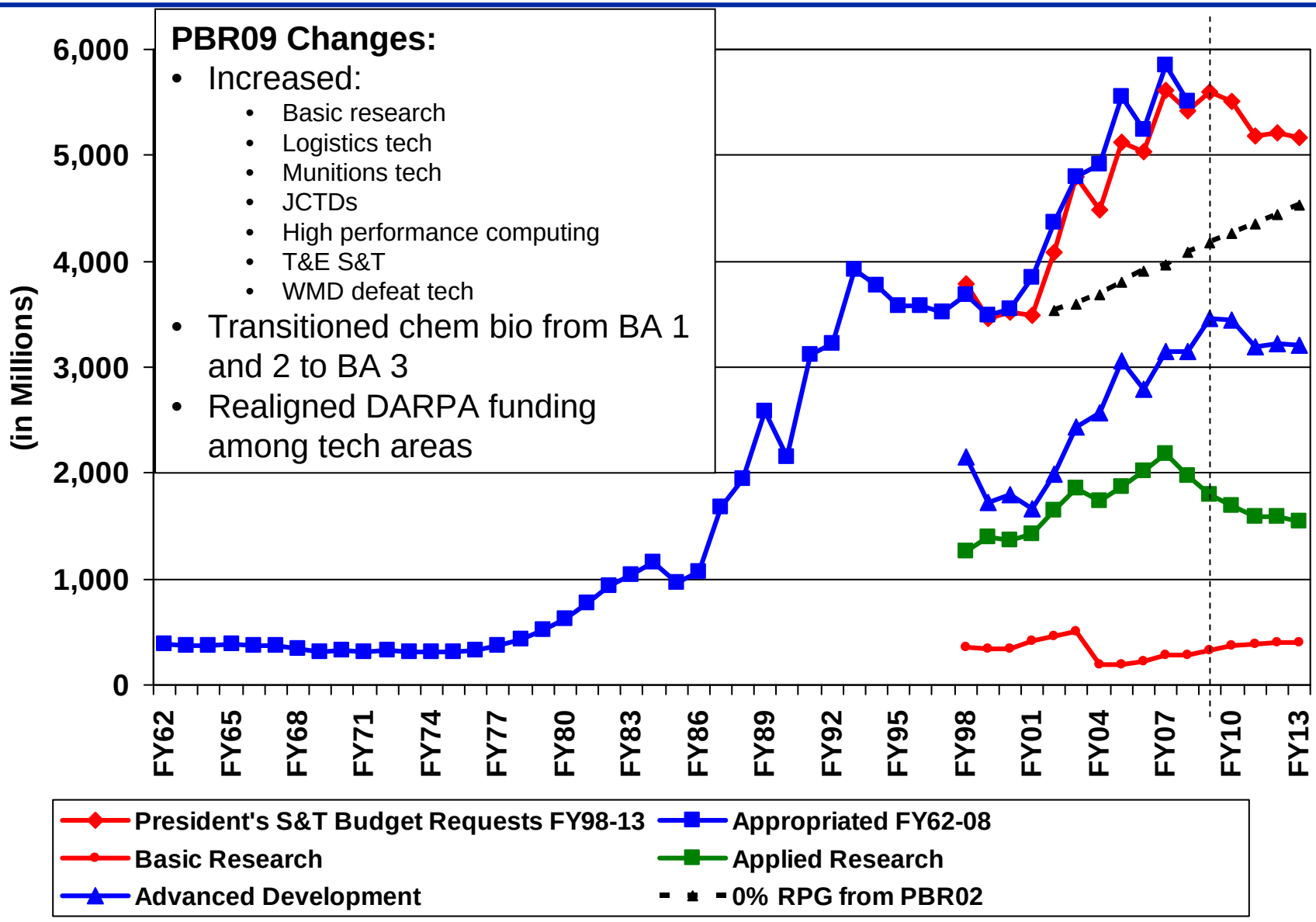
PBR09 Changes:

- Increased funding for
  - Basic research
  - Information and Command, control and communications systems tech
  - Space tech
  - Sensor tech
  - Advanced aerospace systems (Blackswift)
  - Cyber protection (BA 6)
- Reduced funding for
  - Cognitive computing
  - Biological warfare
  - Materials and biological tech
  - Advanced electronics tech
  - Guidance tech
- Cancelled funding for land warfare and distributed learning techs



Defense-Wide S&T Funding

- in Then Year Dollars -



S&T Budget Observations
- Differences from FY08 Request -

Army
- Increased
  - Basic research
  - Active and conventional armor technology
  - Plasma research
- Reduced
  - Combat vehicle and automotive advanced technologies
  - Advanced tactical computer science and sensor technologies

Navy
- Increased
  - Basic research
  - Protection for ground forces
  - RF systems advanced technology
  - Common picture technology (High-Integrity GPS)
- Transitioned several programs into BA 3
- Reduced force protection for platforms

S&T Budget Observations *(Cont'd)*
- Differences from FY08 Request -

Air Force

- Increased
  - Basic research
  - Funding for energy efficient engine technologies at varying speeds (Highly Efficient Embedded Turbine Engine, Adaptive Versatile Engine Technology, materials technology)
  - Hypersonics (Blackswift) **
- Realigned MANTECH into BA 3 - 0603680F
- Reduced aerospace technology development and demonstration

***Note**: Air Force Blackswift funded in Airborne Reconnaissance (PE 0305206F)*

S&T Budget Observations *(Cont'd)*
- Differences from FY08 Request -

Defense-wide

- Increased
  - Basic research for the National Defense Education Program and remote detection of fissile materials
  - Logistics technologies (TRANSCOM as distribution process owner)
  - Munitions technologies
  - JCTDs
  - High performance computing
  - T&E S&T
  - WMD defeat technologies
  - Cyber protection
  - Advanced aerospace systems (Blackswift)
- Transitioned chem bio from BAs 1 and 2 to BA 3
- Realigned DARPA funding among tech areas

Strategic Context

Strategic Framework

- **National Security Strategy of United States (Sept 2002) set national imperative to defend against WMD**
- **National Security Strategy also introduced the following terms:**
  - Traditional
  - Irregular
  - Catastrophic
  - Disruptive

  } ***Transformational***
- **Concept validated in 2006 Quadrennial Defense Review**

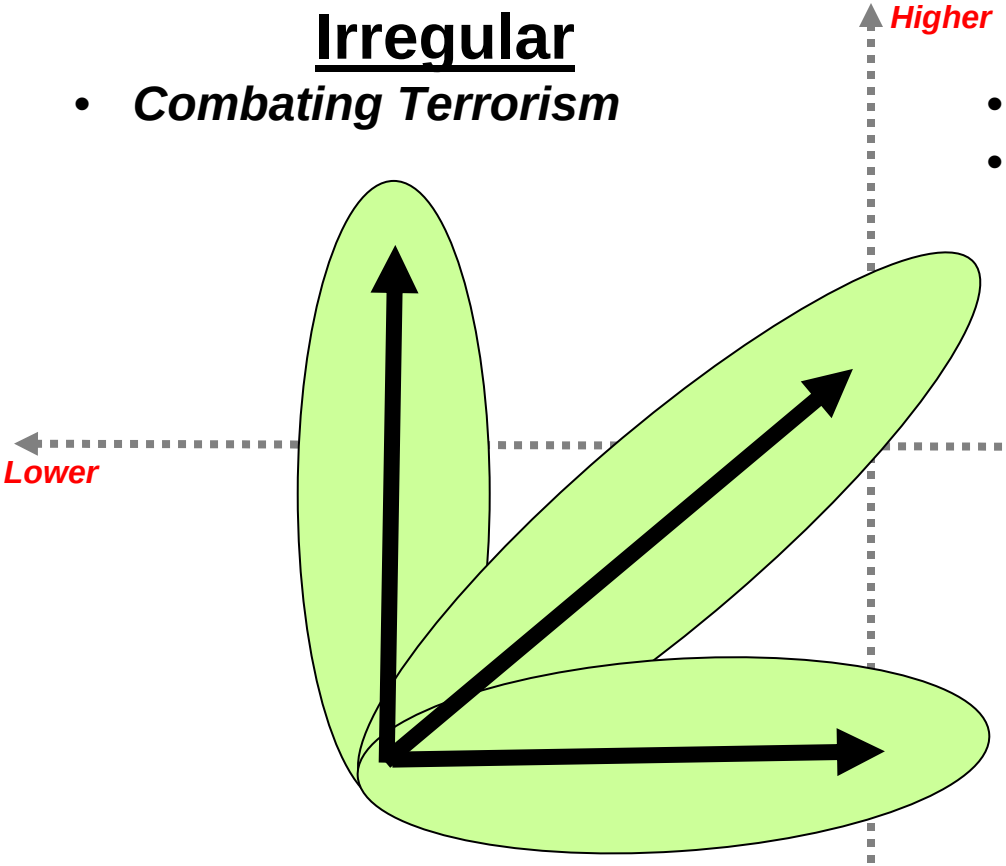
National Defense Strategy Drives Investment Strategy

Irregular

- *Combating Terrorism*

Catastrophic

- *Protection Against WMD*
- *Protection Against Chem Bio Attacks*



Disruptive

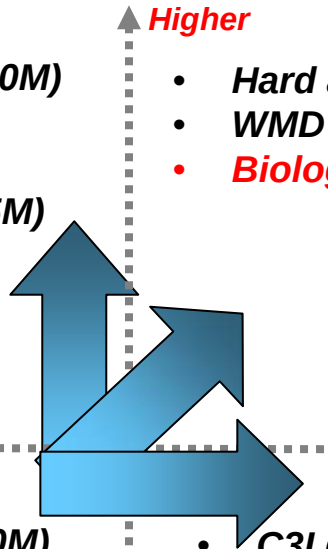
- *New Technology Investment that Provides New Capabilities*

Traditional

Decrease Investment in Platform Technologies

R&E Funds Transformational Technologies

- Investment Priority Changes (Non-Space Programs) from PBR08 to PBR09 -



Irregular

- *Protection for ground forces (Navy +$40M)*
- *Joint Service Explosive Ordnance Development ($+32M)*
- *Active/Conventional Armor (Army +$25M)*

Catastrophic

- *Hard and deeply buried targets (Navy $+49M)*
- *WMD Defeat Tech (DTRA +$29M)*
- *Biological Warfare Defense (DARPA -$33M)*

Traditional

- *Distribution Process Owner (OSD $+30M)*
- *Force Protection (Navy $-40M)*
- *Land Warfare Tech (DARPA -$25M)*
- *Combat Vehicle and Automotive Adv Tech (Army -$23M)*
- *Aerospace Technology Dev (AF -$20M)*

Disruptive

- *C3I (DARPA +$105M)*
- *Propulsion tech (AF +$90M)*
- *Space Tech (DARPA +$63M)*
- *Cyber protection (DARPA +$50M)*
- *Common Picture Tech (Navy +$47M)*
- *Sensor tech (DARPA +$30M)*
- *National Defense Education Program (OSD $+25M)*
- *High Performance Computing (OSD +$20M)*
- *Special technologies (Army +$18M)*
- *RF System Advanced Tech (Navy +$14M)*
- *Advanced Tactical Computer Science and Sensor Tech (Army -$19M)*

Higher (top)

Lower (bottom)

VULNERABILITY

Lower (left)

Higher (right)

LIKELIHOOD

Basic Research underpins all areas (+$270M)

DDR&E Programs

DDR&E PBR09 Programs

- *Then Year Dollars* -

BA	PE	PE Title	FY2008 Enacted	FY2009	FY2010	FY2011	FY2012	FY2013
1	0601111D8Z	Government/Industry Co-sponsorship of University Research (GICUR)	6,200	0	0	0	0	0
1	0601114D8Z	Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)	17,078	2,833	0	0	0	0
1	0601120D8Z	National Defense Education Progam (NDEP)	44,372	68,972	91,484	114,122	127,771	130,136
2	0602000D8Z	Joint Munitions Technology	12,542	15,254	15,371	15,250	15,453	15,671
2	0602227D8Z	Medical Free Electron Laser	2,400	0	0	0	0	0
2	0602228D8Z	Historically Black Colleges and Universities and Minority Institutions (HBCU/MI)	37,790	15,156	15,426	15,706	15,915	16,140
2	0602234D8Z	Lincoln Laboratory	29,524	31,340	31,954	31,003	31,417	31,860
2	0602670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	6,300	7,685	9,609	9,902	16,539	18,818
3	0603000D8Z	Insensitive Munitions Advanced Technology	4,000	15,970	20,802	17,824	22,779	24,760
3	0603002D8Z	Medical Advanced Technology	0	0	0	0	0	0
3	0603225D8Z	Joint DoD/DOE Munitions	23,488	23,727	23,701	23,823	24,141	24,481
3	0603618D8Z	Joint Electronic Advanced Technology	12,419	9,320	9,529	9,851	9,982	10,122
3	0603648D8Z	Joint Capability Technology Demonstration (JCTD)	204,252	206,337	201,975	195,537	198,276	201,211
3	0603662D8Z	Networked Communications Capabilities	15,000	39,923	28,727	26,302	26,697	27,266
3	0603665D8Z	Biometrics Science and Technology	10,200	10,579	11,194	11,981	12,182	15,054
3	0603670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	3,000	9,381	11,689	12,080	20,204	22,978
3	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program (DWMS&T)	23,800	11,981	14,906	19,853	19,856	24,808
3	0603711D8Z	Joint Robotics/Autonomous Systems	19,756	8,449	9,276	10,435	11,634	11,973
3	0603716D8Z	Strategic Environmental Research and Development Program (SERDP)	69,674	69,038	70,438	71,388	72,338	73,357
3	0603727D8Z	Joint Warfighting	11,060	11,098	11,339	11,509	11,662	11,826
3	0603745D8Z	Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)	3,500	7,984	4,953	0	0	0
3	0603750D8Z	Advanced Concept Technology Demonstration (ACTD)	1,600	0	0	0	0	0
3	0603755D8Z	High Performance Computing Modernization Program (HPCMP)	206,807	208,079	215,278	200,933	211,363	218,506
3	0603781D8Z	Software Engineering Institute (SEI)	25,951	31,244	31,870	32,441	32,909	33,403
3	0603826D8Z	Quick Reactions Special Projects (QRSP)	114,234	113,924	114,565	108,421	109,865	111,413
3	0603828D8Z	Joint Experimentation	108,177	114,947	117,571	118,813	120,396	122,093
3	0603832D8Z	Joint Wargaming Simulation Management Office	22,837	38,147	39,208	40,027	40,559	41,130
3	0603942D8Z	Defense Technology Link (TechLink)	5,834	2,170	2,259	2,259	2,275	2,303
4	0604648D8Z	Joint Capability Technology Demonstration (JCTD)	2,960	14,962	18,911	18,886	19,917	19,959
4	0604670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	1,000	5,991	7,132	7,823	12,875	15,621
4	0604787D8Z	Joint Systems Integration Command	19,375	19,643	20,098	20,360	20,631	20,921
4	0604828D8Z	Joint Fires Integration & Interoperability	16,596	16,906	17,277	17,449	17,681	17,930
5	0604051D8Z	Defense Acquisition Challenge Program (DACP)	28,970	30,363	30,882	31,002	31,416	31,859
5	0605140D8Z	Trusted Foundry	43,604	42,360	41,953	41,587	42,141	42,735
5	0605648D8Z	Defense Acquisition Executive (DAE)	5,838	5,883	5,850	5,810	5,888	5,970
6	0605110D8Z	Militarily Critical Technology Program (MCTP)	4,021	4,007	4,007	3,978	4,031	4,087
6	0605130D8Z	Foreign Comparative Testing (FCT)	32,919	34,910	35,719	34,381	34,839	35,330
6	0605798D8Z	Defense Technology Analysis	13,727	11,040	11,215	11,432	11,589	11,733
6	0605799D8Z	Force Transformatlon	20,585	20,701	21,361	21,679	22,022	22,362
6	0605801KA	Defense Technical Information Center (DTIC)	51,515	52,696	54,674	56,353	57,246	58,142
7	0607828D8Z	Joint Integration and Interoperability	53,893	49,371	48,108	47,705	48,340	49,022
		TOTAL DDR&E PORTFOLIO	**1,336,797**	**1,382,370**	**1,420,311**	**1,417,906**	**1,482,829**	**1,524,977**

Summary

- **PBR09 shows SecDef's commitment to a strong S&T program – especially basic research**
  - Focused on key technical challenges
  - With flexibility to address emerging technology areas

- **PBR09 is four percent higher than the PBR08 request, in real terms**
  - PBR09 request is within $200M of highest request (PBR07), adjusted for inflation
  - SecDef directed significant increase in basic research (+16% higher than PBR08, adjusted for inflation)
  - Investment shifted to QDR-highlighted capabilities