Fiscal Year 2017 President's Budget Request for the DoD Science & Technology Program April 12, 2016

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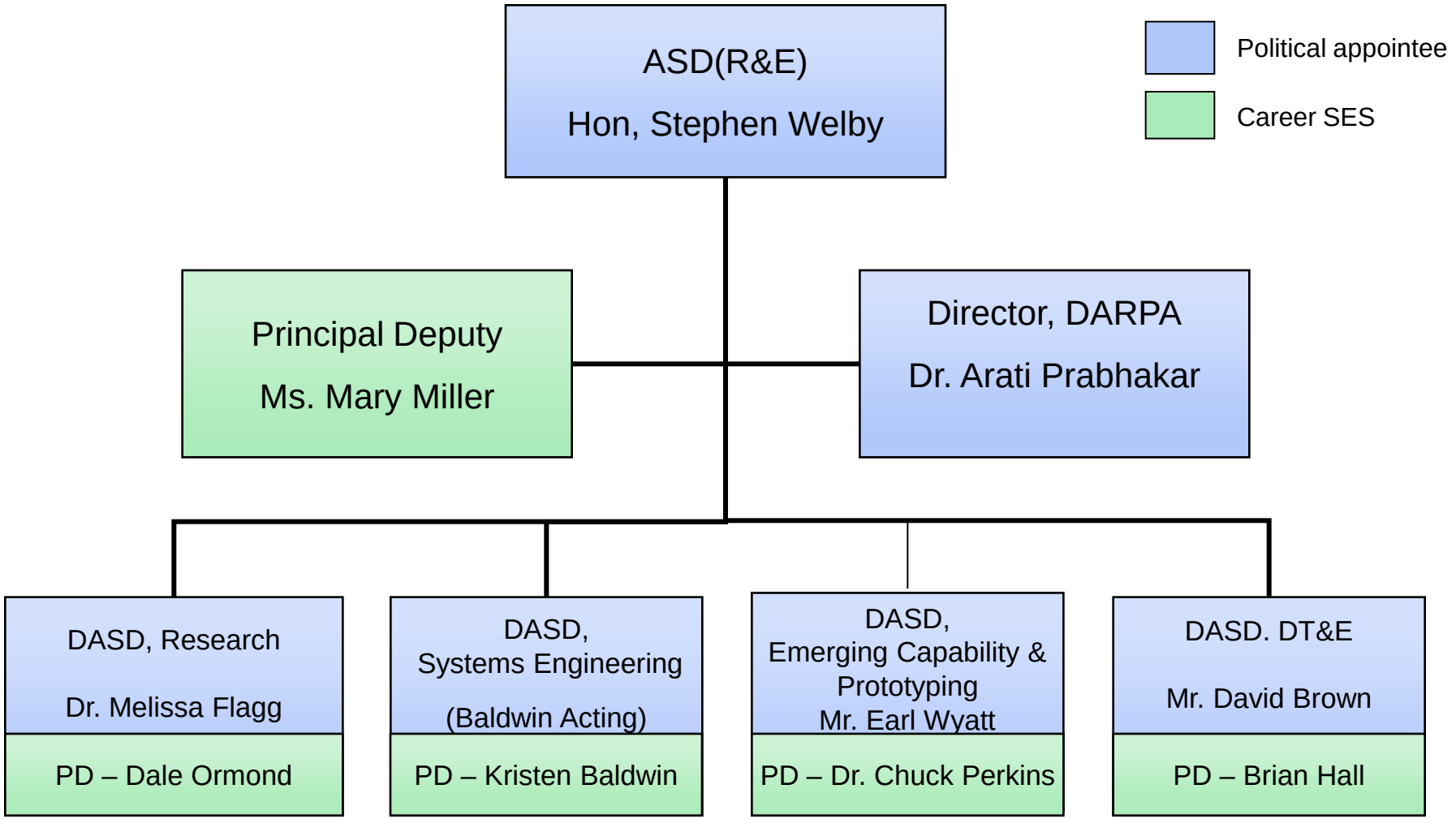
ASD(R&E) – Organization



Outline

- ***Guidance, Priorities, and Strategy***
- ***FY2017 S&T President's Budget Request***
- ***Historical Context***
- ***Reliance 21 & Communities of Interest (COIs)***

DOD Alignment with FY 2017 Administration Priorities

- **S&T/ RDT&E:** DOD continues to prioritize research and development with an S&T investment of $12.5B and RDT&E investment of ~$71.4B
- **DARPA:** High-risk, high-payoff research is critical to long-term technological superiority (~$3.0B)
- **Advanced Manufacturing:** Support of the President's National Network Manufacturing Initiative with funding for eight DOD-led manufacturing institutes (~$140M)
- **R&D Infrastructure:** Support R&D infrastructure to ensure that U.S. science and engineering remain at the leading edge. For example, DOD has increased its hypersonic T&E infrastructure investment to ~$50M in FY 2017 to develop the state-of-the-art test capabilities that will enable the Nation to advance hypersonic technologies.
- **Science, Technology, Engineering and Mathematics (STEM) Education:** Support Military Child STEM, the Science, Mathematics, and Research for Transformation (SMART) and the National Defense Science and Engineering Graduate (NDSEG) Fellowship Program with ~$88M in FY 2017

2014 Quadrennial Defense Review

- **Builds upon/updates the 2012 Defense Strategic Guidance**
  - **Protect the homeland against all strategic threats**
  - **Build security globally by projecting U.S. influence and deterring aggressors**
  - **Project power and win decisively**

- **Embodies key elements of January 2012 Defense Strategy**
  - **Rebalance to Asia-Pacific**
  - **Sustaining commitments to allies in Middle East and Europe**
  - **Aggressively pursue counterterrorism campaign**
  - **Emphasis on key threat areas (e.g., cyber capabilities, missile defense, electronic warfare, space capabilities etc.)**
  - **No longer size forces for large, prolonged stability operations**




Need for Technological Superiority
-- Meeting Today's Challenges --

"Today's security environment is dramatically different…and we have five evolving challenges that have driven the focus of the Defense Department's planning and budgeting this year."

- **Deter Russian Aggression in Europe**
- **Continue our rebalance to the Asia-Pacific where China is a rising power**
- **North Korea is a rising threat to the U.S. and its allies**
- **Counter Iran's influence against our friends and allies**
- **The ongoing fight to defeat terrorism and especially ISIL**

Secretary of Defense, Ash Carter, Economic Club, Wash. DC, Feb 2, 2016

Defense R&E Strategy

1. **Mitigate current and anticipated threat capabilities**
   - Cyber
   - Electronic Warfare
   - Counter Space
   - Counter-WMD
   - Missile Defense
2. **Affordably enable new or extended capabilities in existing military systems**
   - Systems Engineering
   - Modeling and Simulation
   - Capability Prototyping
   - Developmental Test & Eval.
   - Interoperability
   - Power & Energy
3. **Create technology surprise through science and engineering**
   - Autonomy
   - Data Analytics
   - Human Systems
   - Hypersonics
   - Quantum Systems
   - Basic Sciences

Technology Needs

- Cyber / Electronic Warfare
- Engineering / M & S
- Capability Prototyping
- Protection & Sustainment
- Advanced Machine Intelligence
- Anti-Access/Area Denial (A2/AD)

Examples of FY 2017 S&T Investments aligned to Defense R&E Strategy

- **Mitigate**
  - Counter Weapons of Mass Destruction (~$0.9B)
  - Cyberspace and Space (~$1.0B)
  - Electronic Warfare (~$0.4B)
- **Surprise**
  - High-speed Strike Weapons (~$0.3B)
- **Affordability**
  - Advanced Manufacturing (~$0.14B)
  - Prototyping Efforts (~$0.3B)

~$3.0B in S&T activities that align with the '3 principles'

Preserving Technological Superiority

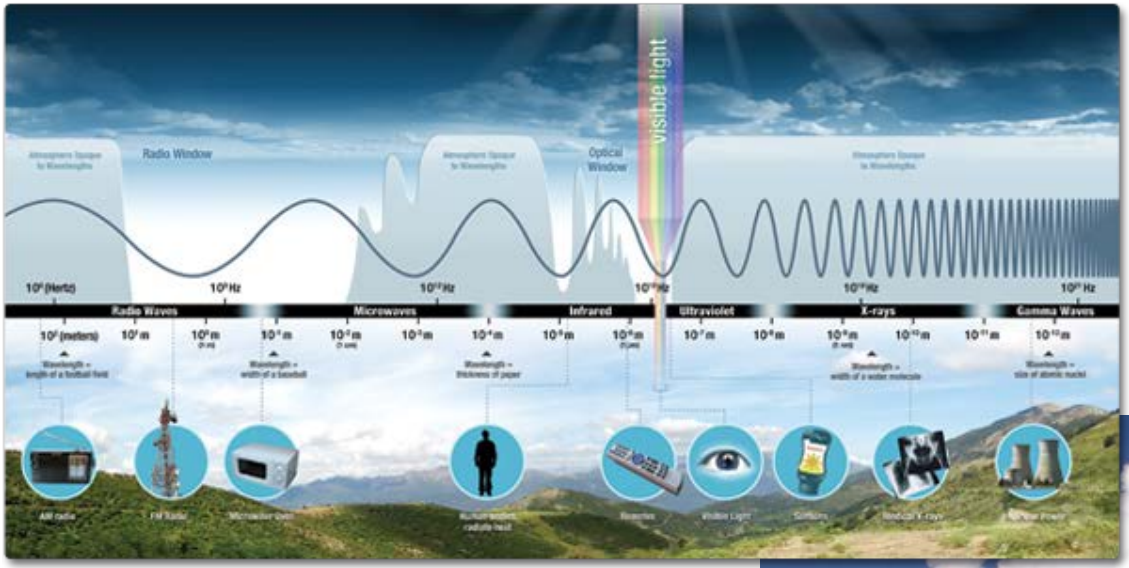
- **US and Allies have been able to count on a decisive technological advantage for more than 40 years**
  - Advantage built on technologies developed by and for the US military
    - Precision weapons, long-range intelligence, surveillance and reconnaissance (ISR), stealth




Yesterday's Investment in S&T Provided Today's Capability Advantage

- **What has changed:**
  - Increasing global access to technology and talent
  - Competitors investing in capabilities directly designed to counter US technical advantages

Rise of the Commons
Cyber, Electromagnetic Spectrum & Space



Military operations increasingly depend on being able to operate in places "no one owns" – *the Commons*

Previous Offset Strategies

- **"First Offset Strategy"**
  - Emphasis on ***nuclear deterrence to avoid the large increase in defense expenditures*** that would be necessary to conventionally deter Warsaw Pact forces during the 1950s.
- **"Second Offset Strategy"**
  - Following the Vietnam War, U.S. tolerance for defense expenditures plummeted while Warsaw Pact forces outnumbered NATO forces by three to one in Europe.
  - DoD sought ***technology to "offset" the numerical advantages*** by holding adversary forces at risk before they could bring larger forces to bear
    - Emphasized: Intelligence, Surveillance, and Reconnaissance (ISR) platforms; Precision-Guided Weapons; Stealth; and the expansion of space's role in military communications and navigation.

Technology Enables Strategy

A Third Offset Strategy

- **"Third Offset Strategy"**
  - To ***"offset" advances in Anti-Access/Area Denial systems***
  - Promising technology areas include: robotics and systems autonomy, human systems, miniaturization, biotechnology, advanced computing and big data, and advanced manufacturing
  - Potential components include:
    - **Autonomous Learning Systems Making Time Critical Decisions**
      - **Delegating decisions to machines in applications that require faster-than-human reaction times, i.e. Cyber Defense, Missile Defense, EW**
    - **Human-Machine Collaborative Decision Making**
      - **Exploiting the advantages of both humans and machines for better and faster decisions, i.e. humans providing strategic guidance combined with the tactical acuity of a computer**

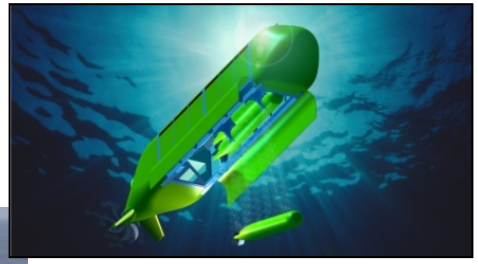
A Third Offset Strategy (Contd.)

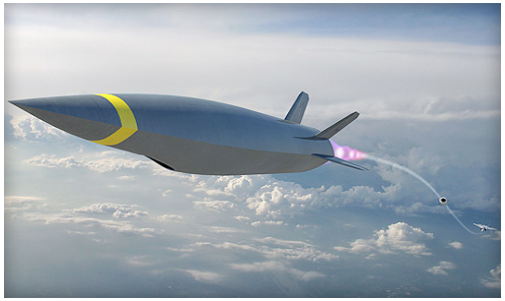
- Potential components include (contd.):
  - **Machine Assisted Human Operations**
    - **Machines helping humans perform better in combat**
  - **Advanced Manned/Unmanned Systems Operations**
    - **Employing innovative cooperative operations between manned and unmanned platforms, i,e. "swarm operations"**
  - **Network-Enabled, Autonomous Weapon Systems, Hardened to Operate in a Future Cyber/EW Environment**
    - **Enabling for cooperative weapon systems operations in communications-denied environments**

FY 2017 will be a year of considerable war-gaming and testing of theories and operational concepts. The strategy is constantly being updated.

DoD Needs to Develop New Ways to Project Power

- Improved Intelligence, Surveillance, & Reconnaissance
- Electronic Attack / Electronic Protection
- Surface to Surface Ship Missiles
- Ballistic and Cruise Missile Defense





- Improved Long-Range Precision Strike
- Cyber and Space Capabilities
- Undersea Warfare
- Advanced Air Defenses

Technologically advanced capabilities needed for the future

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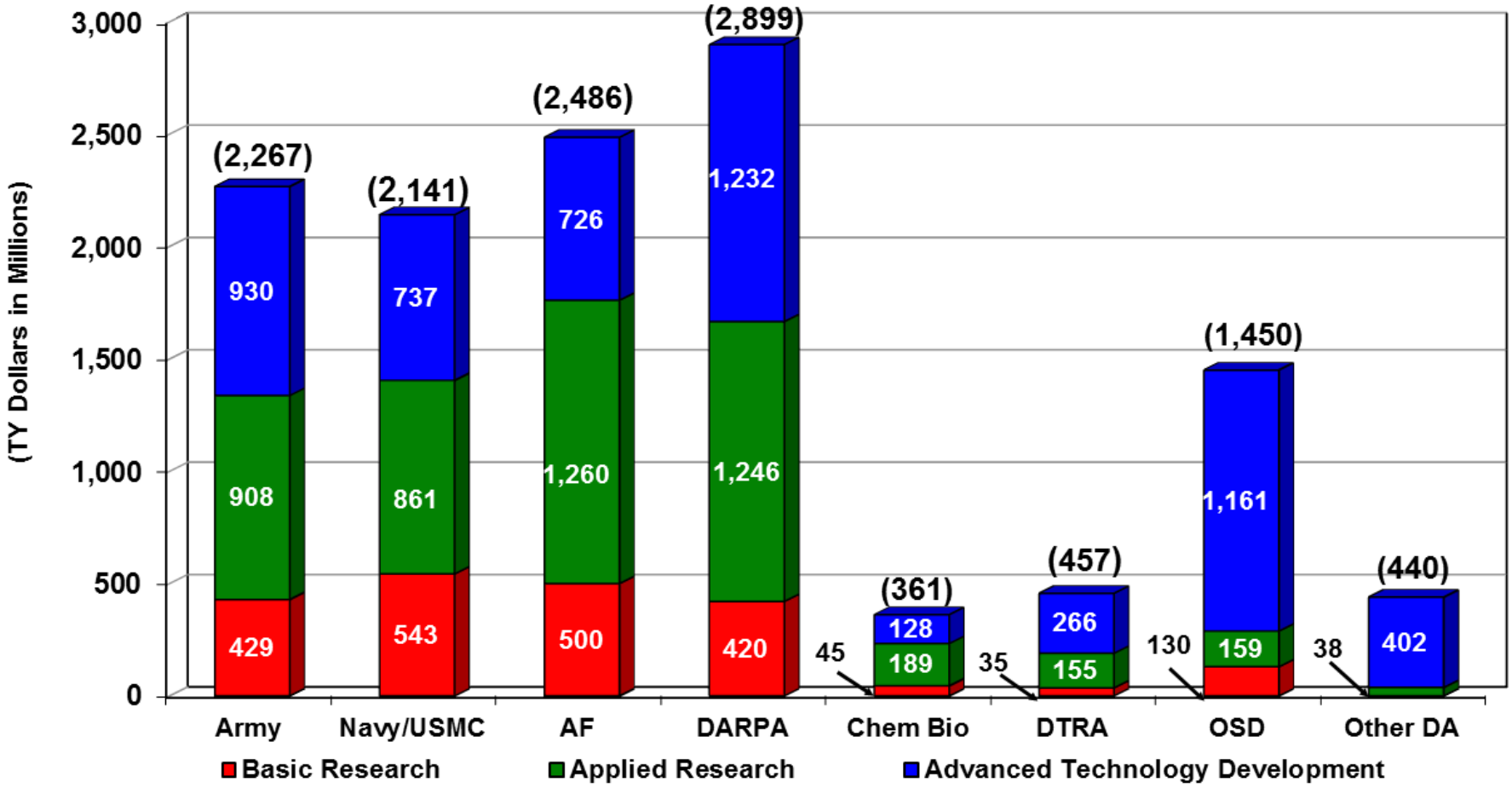
PB 17 DoD S&T Budget Request

Total PB 17 S&T request = $12.50B

Total FY 16 S&T Request = $12.27B

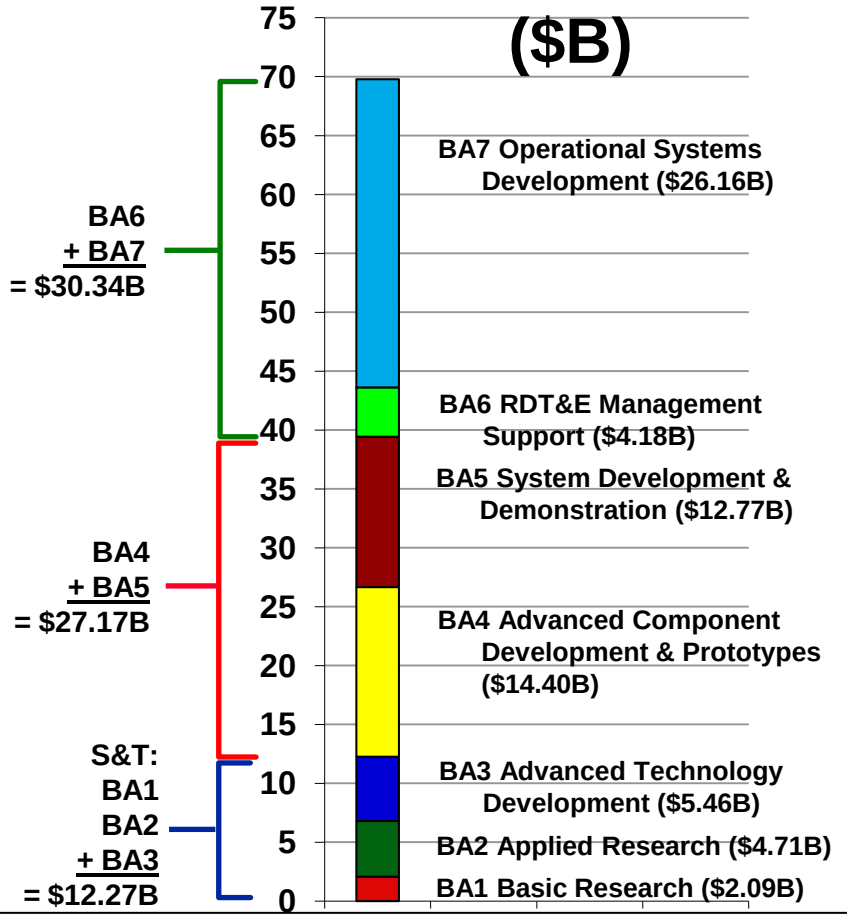
Army = 2,201 Navy = 2,114 AF = 2,378 DARPA = 2,901 ChemBio = 394 DTRA = 485 OSD = 1,334 Other DA = 459



DoD PB-16 & PB-17 RDT&E Budget Request Comparison

- in Then Year Dollars -

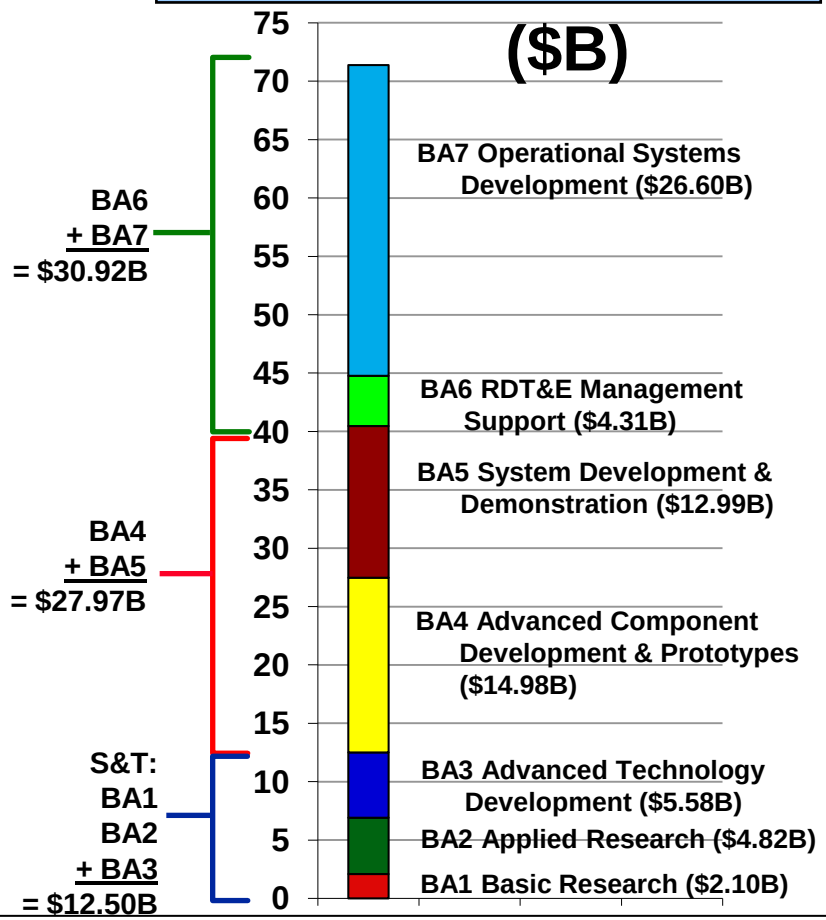
FY 16 RDT&E Request = $69.78B (Budget Activities 1-7)



Technology Base (BA1 + BA2) = $6.80B

S&T is 17.6% of RDT&E;
RDT&E is 13.0% of DOD Topline (Base only)

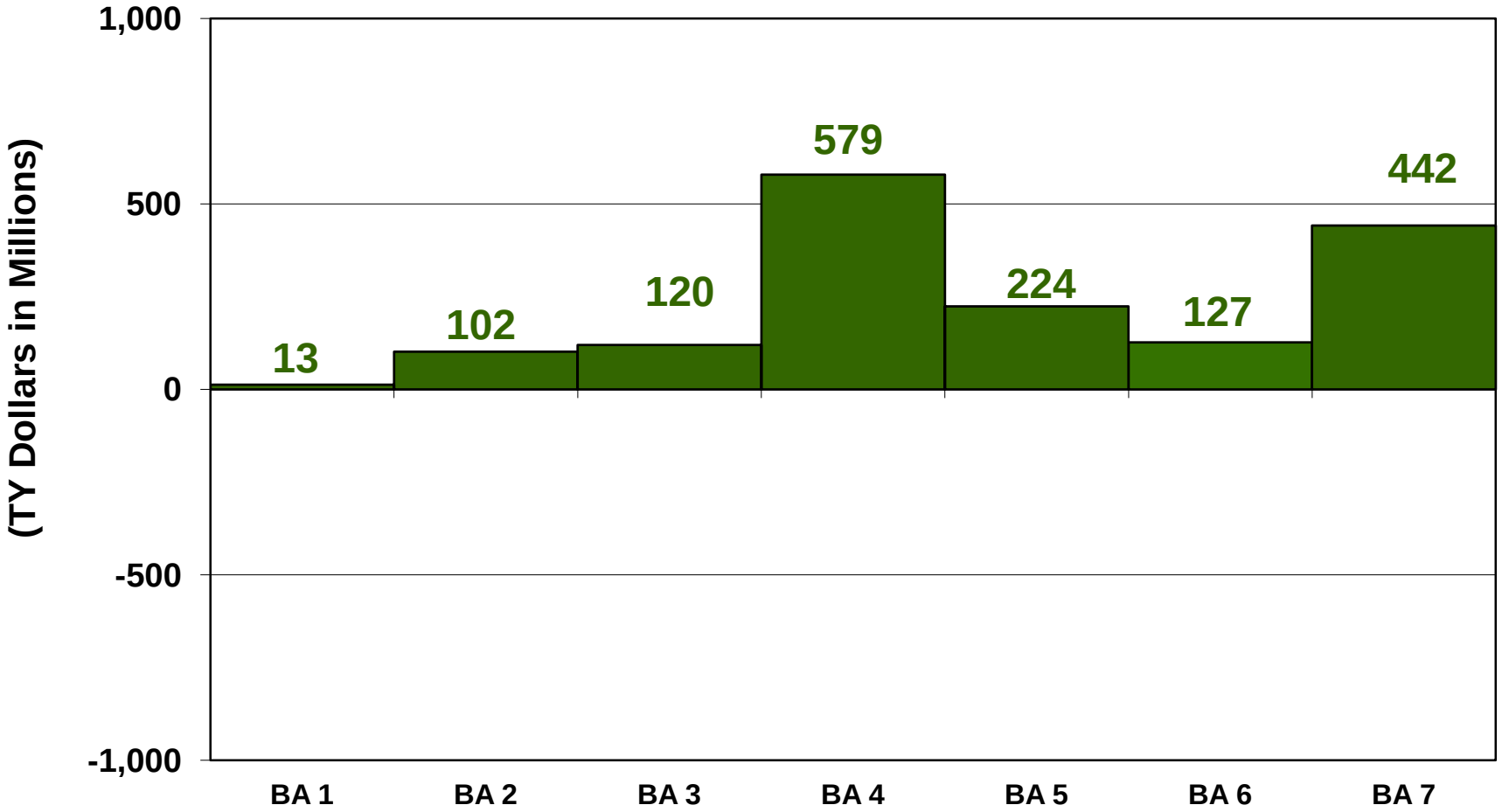
FY 17 RDT&E Request = $ 71.39B (Budget Activities 1-7)



Technology Base (BA1 + BA2) = $6.92B

S&T is 17.5% of RDT&E;
RDT&E is 13.6% of DOD Topline (Base only)

RDT&E Budget Request Overview
- FY 2016 to FY 2017 Adjustments -

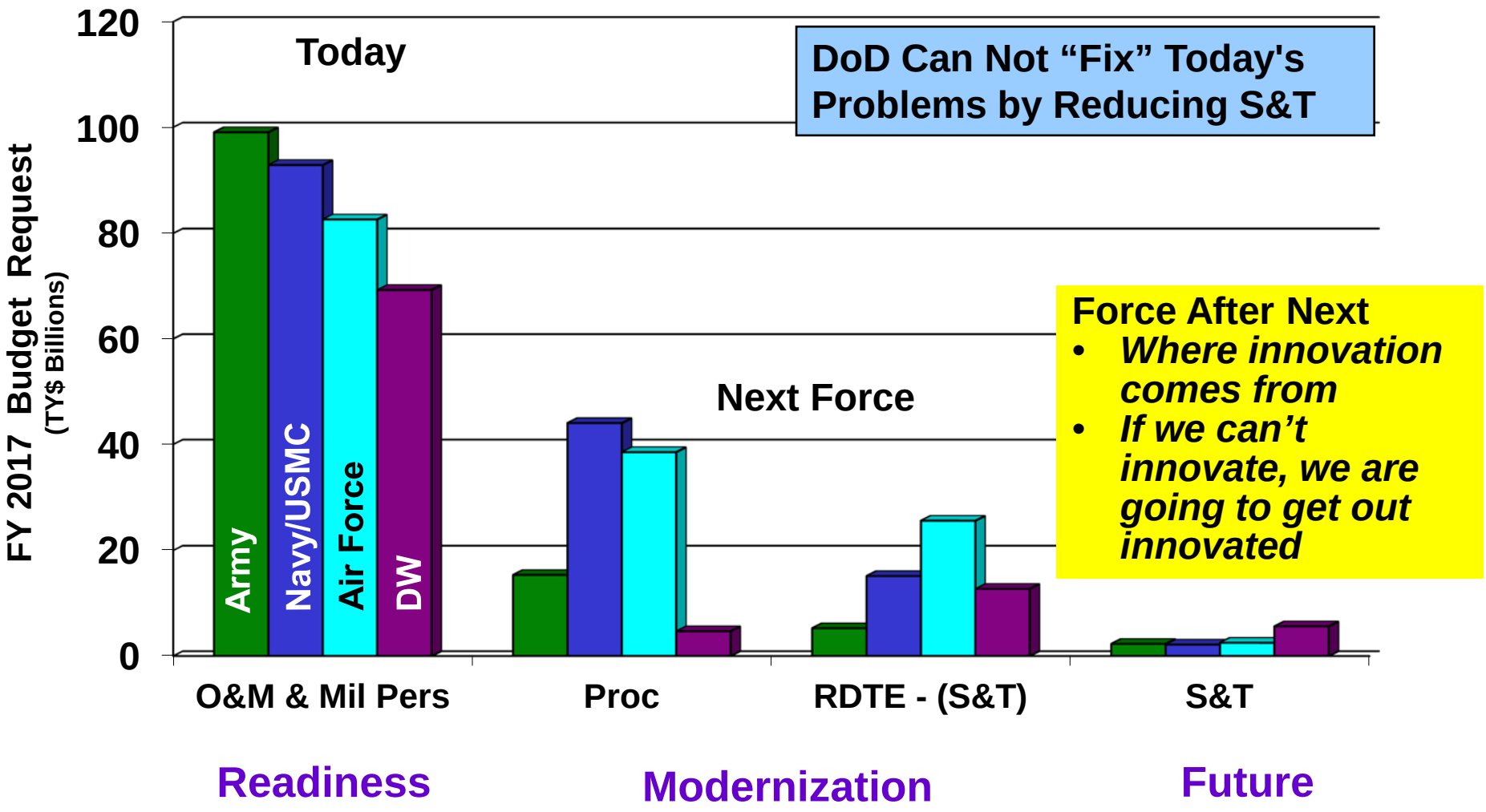


President's Budget Request for 2017
DoD R&E Budget Request Comparison

(TY Dollars in Millions)

	PBR 2016	PBR 2017 (FY 2016 CY $)	% Real Change from PBR 2016
Basic Research (BA 1)	2,089	2,102 (2,063)	-1.23%
Applied Research (BA 2)	4,713	4,815 (4,727)	0.29%
Advanced Technology Development (BA 3)	5,464	5,584 (5,481)	0.31%
DoD S&T	12,266	12,501 (12,271)	0.04%
Advanced Component Development and Prototypes (BA 4)	14,402	14,981 (14,706)	2.11%
DoD R&E (BAs 1 - 4)	26,669	27,482 (26,977)	1.16%
DoD Topline	534,300	524,000 (514,988)	-3.61%

FY 2017 Technology Investment Compared to Other DoD Categories



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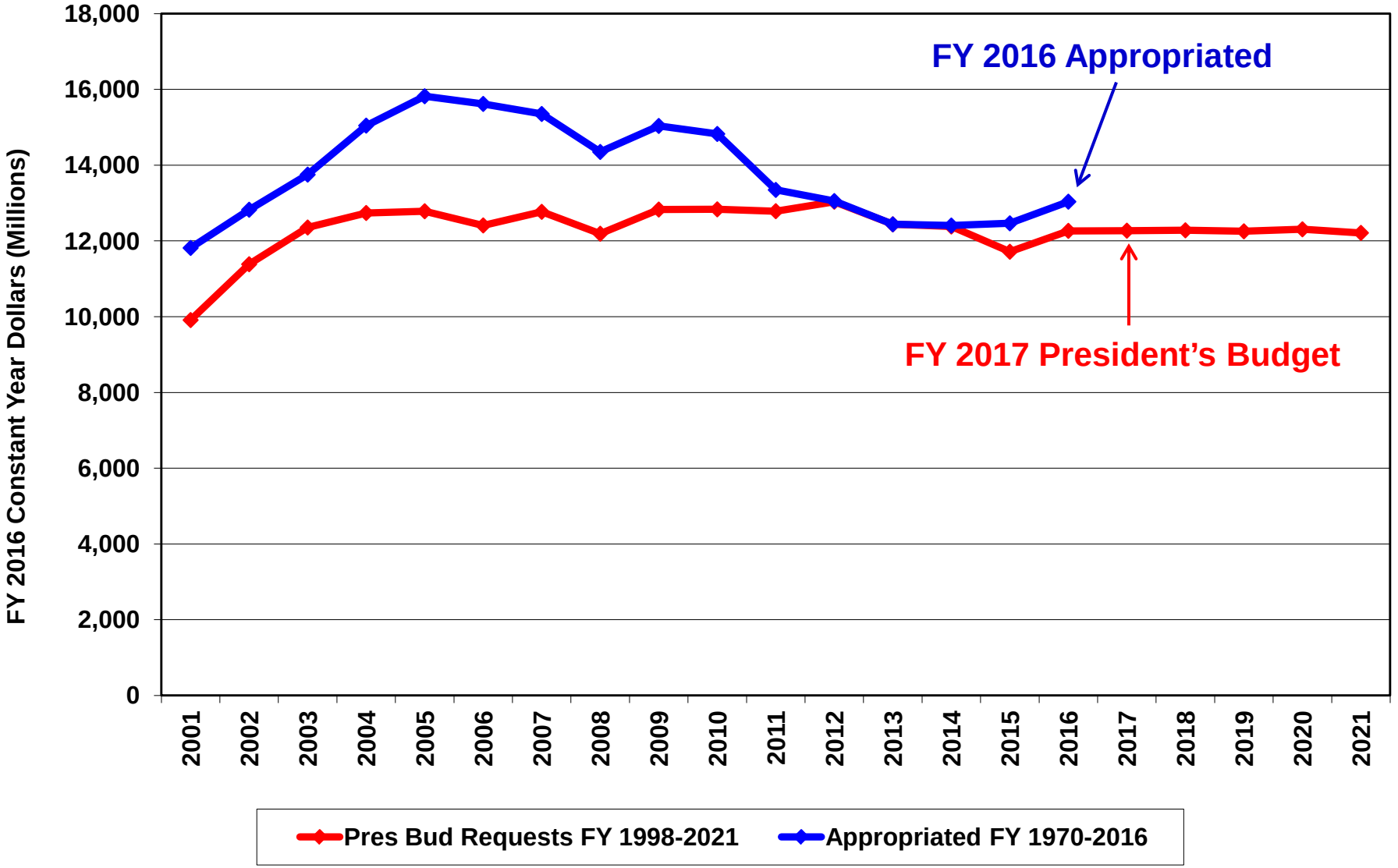
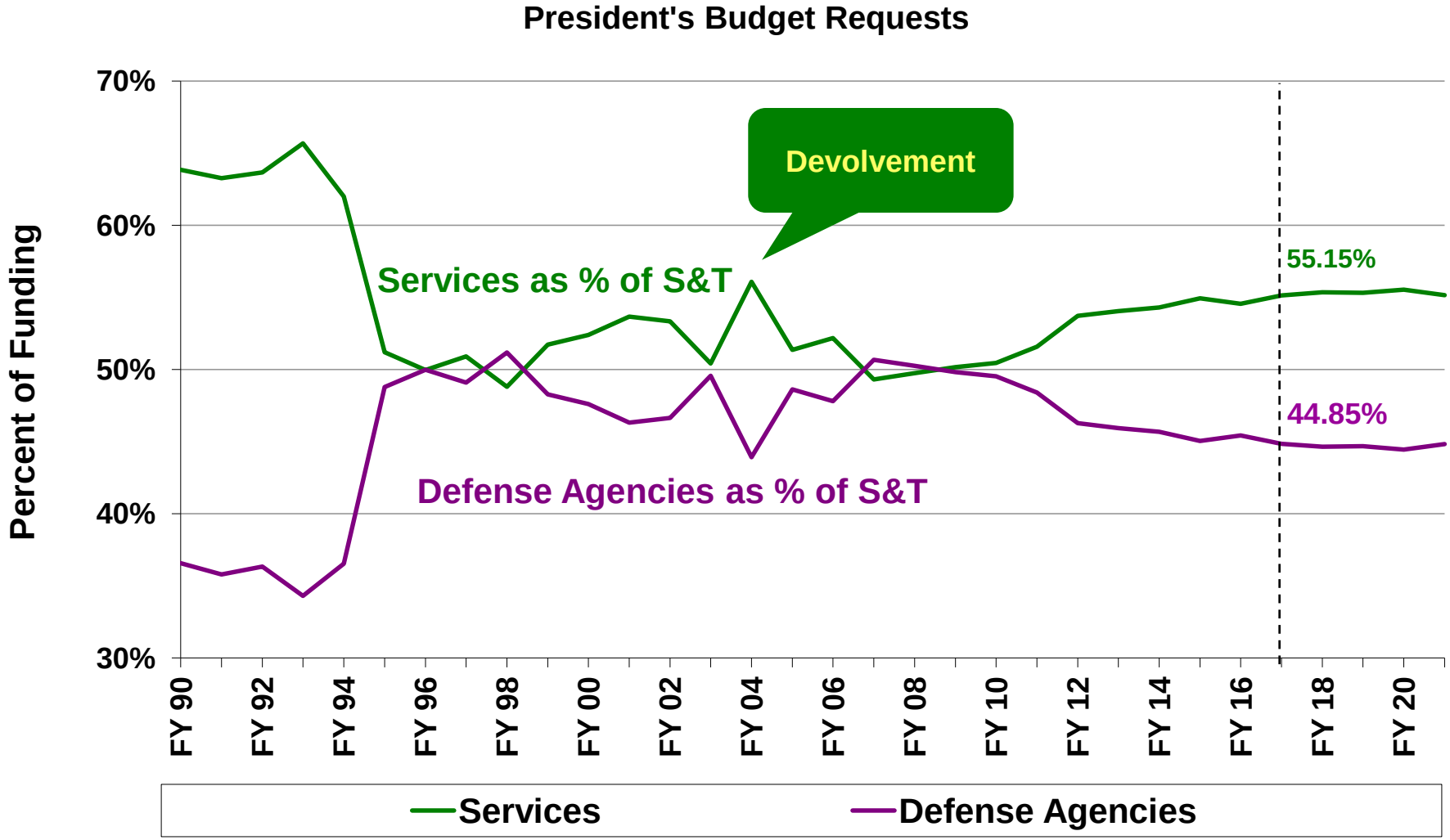
DoD S&T FUNDING: FY 1970-2021

(FY 1970-2015 Appropriated, FY 1998-2021 President's Budget Request)



DoD S&T Breakout

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



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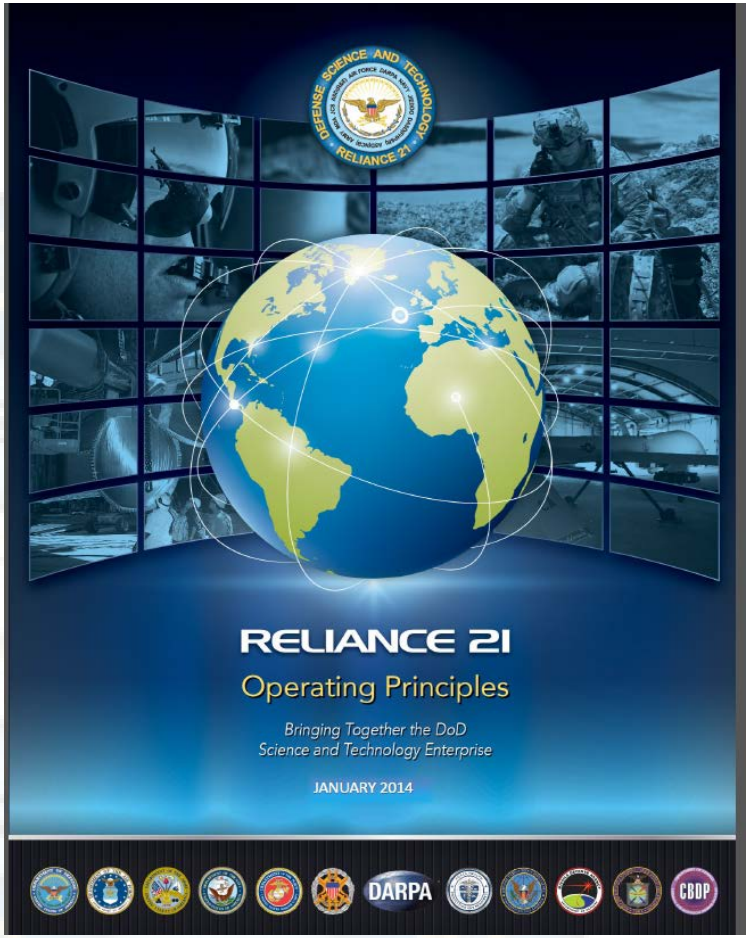
Reliance 21 and COIs

- **Reliance 21 is the overarching framework of the DoD's S&T joint planning and coordination process**
  - **Reliance 21 has roots that go back several decades, and has been continually renewed and refreshed**

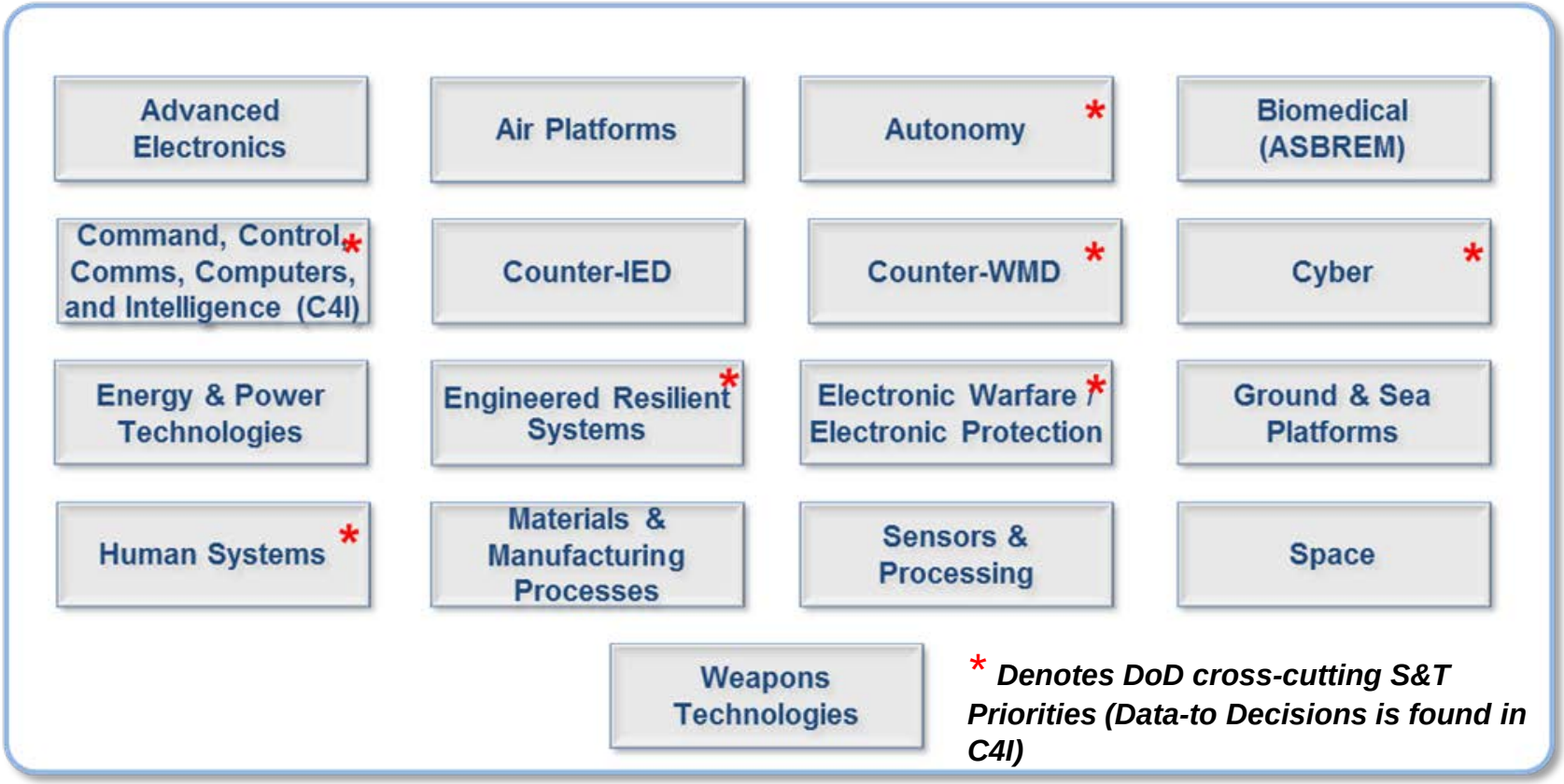
- **COIs (Communities of Interest) are groups of scientists and engineers who are subject matter experts in specific cross-cutting technology areas where there is substantial investment across multiple Components**

- **COIs were established in 2009 as a mechanism to encourage multi-agency coordination and collaboration.**



Found at www.DefenseInnovationMarketplace.mil and www.acq.osd.mil/chieftechnologist/index.html

Reliance 21 Communities of Interest

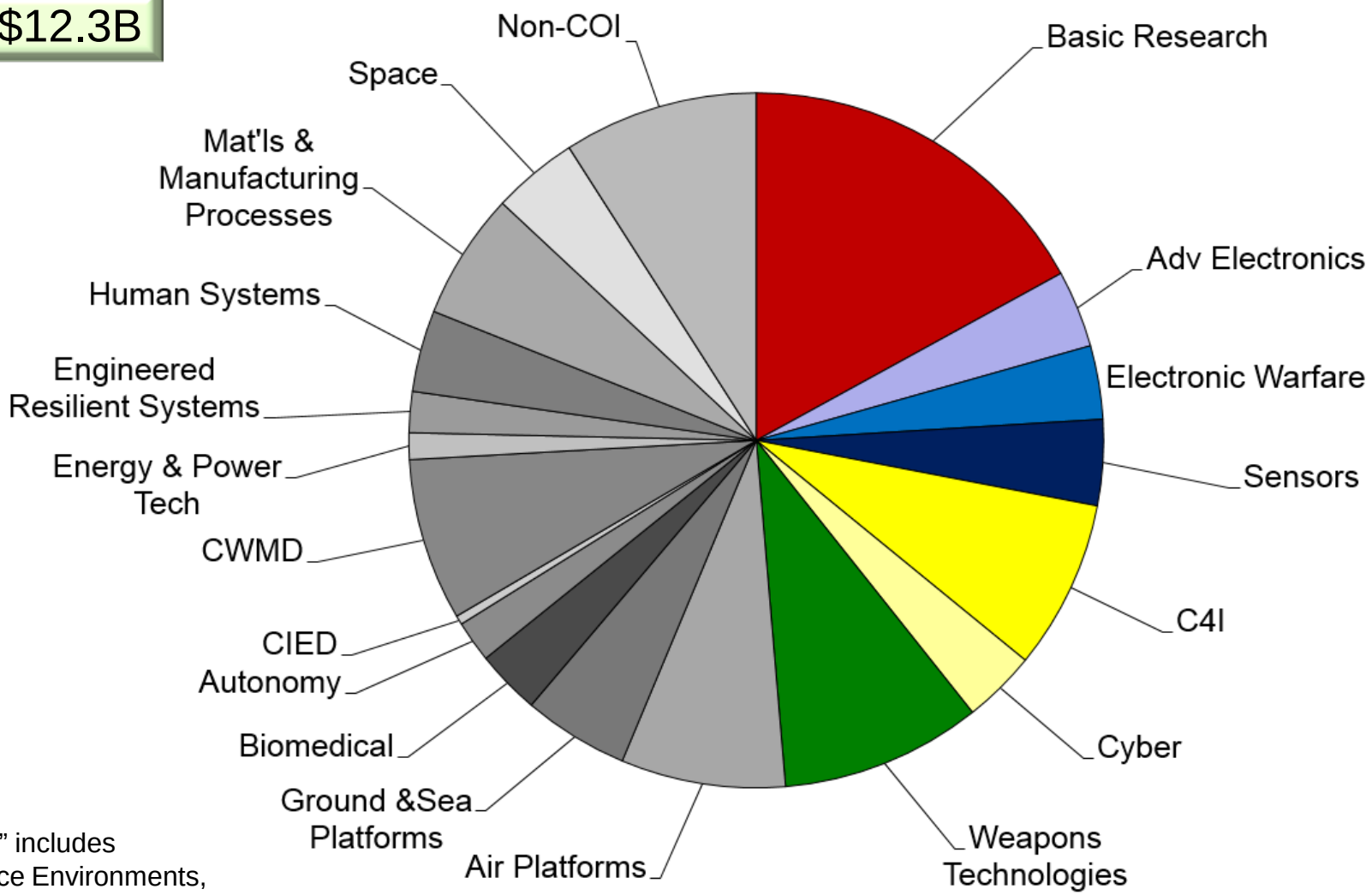


17 cross-cutting technical areas, each with a Steering Group Lead and multiple technical 'challenge areas' staffed with Subject Matter Experts (SMEs) from Services & Defense Agencies

PB 2016 FY 16 S&T

Basic Research BA1 & BA2/BA3 by Community of Interest (COI)

S&T = $12.3B



Note:
- "Non-COI" includes Battlespace Environments, M&S Technology, and other

Summary
--*Where We Are Today*--

- **FY 2017 S&T President Budget Request (PBR) is $12.5 billion, as compared to FY 2016 PBR of $12.3 billion (FY16 appropriation was $13.0 billion)**
  - **S&T is 2.4% of DoD Topline**
  - **S&T maintained 0% real growth FY16 to FY17 PBR**
- **Basic Research is funded at $2.1 billion, as compared to FY16 PBR of $2.1 billion (FY16 appropriation was $2.3 billion)**
- **Defense Advanced Research Projects Agency is funded at $3.0 billion RDT&E to develop technologies for revolutionary, high-payoff, military capabilities**
- **S&T funding for each Military Department is between $2.1 - $2.5 billion**
- **Funds aligned to support strategic guidance and S&T priorities**