USD(R&E)

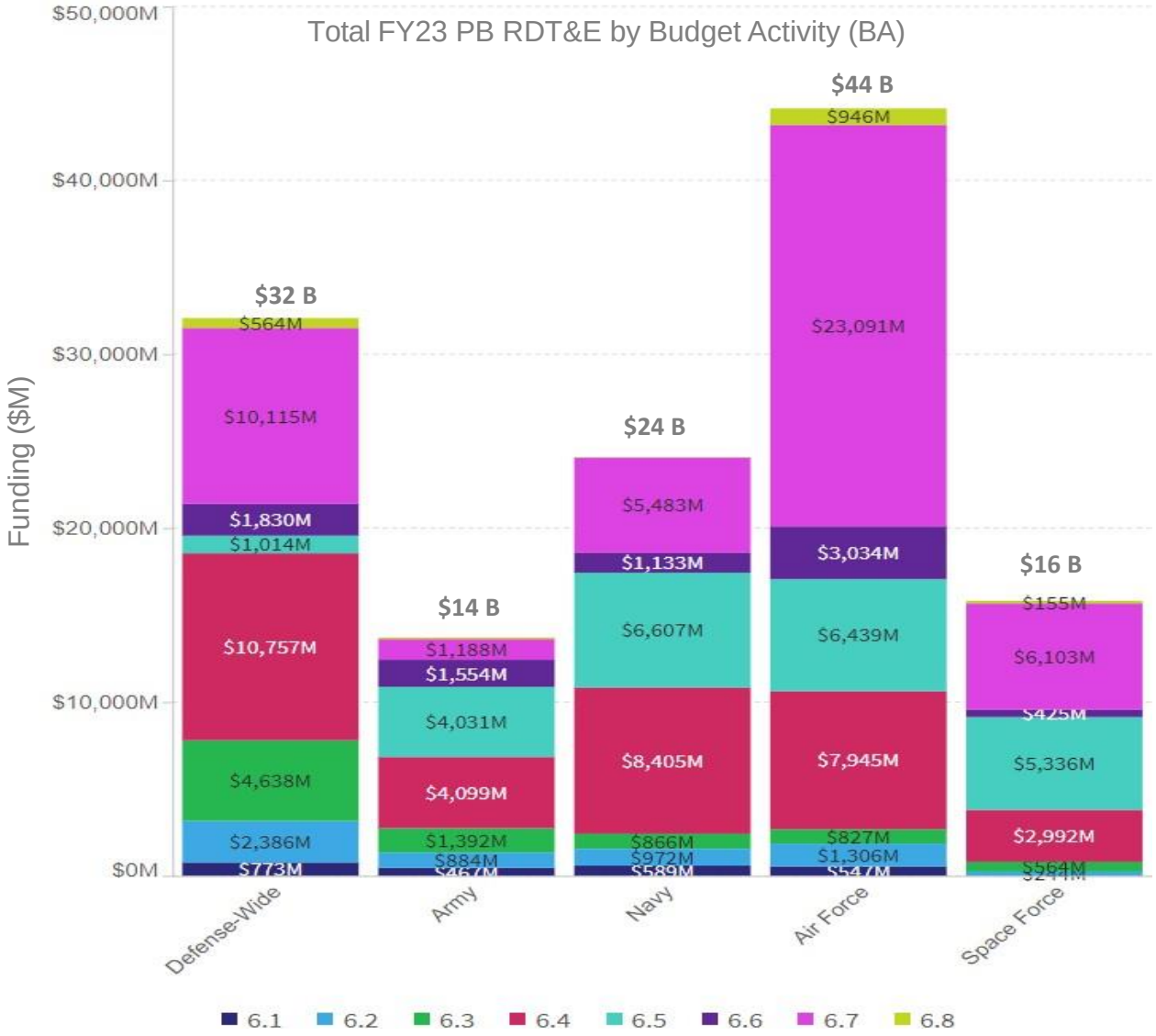
The Honorable Heidi Shyu

Under Secretary of Defense for Research and Engineering

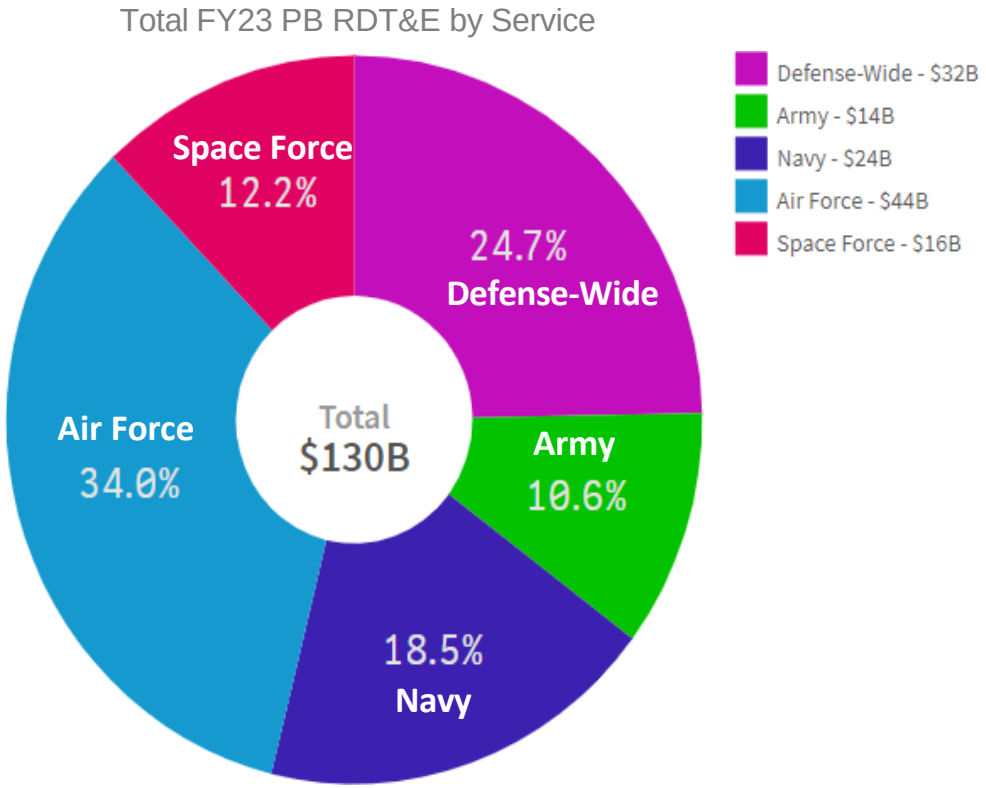
FY23 President's Budget Request - DoD Science and Technology Priorities

Washington, DC
20 April 2022

FY23 PBR DoD-Wide RDT&E (6.1-6.8) Funding - $130B, 21% Higher than FY22 PBR



Total FY23 PB RDT&E Budget of $130B is 21% higher than the FY22 PB

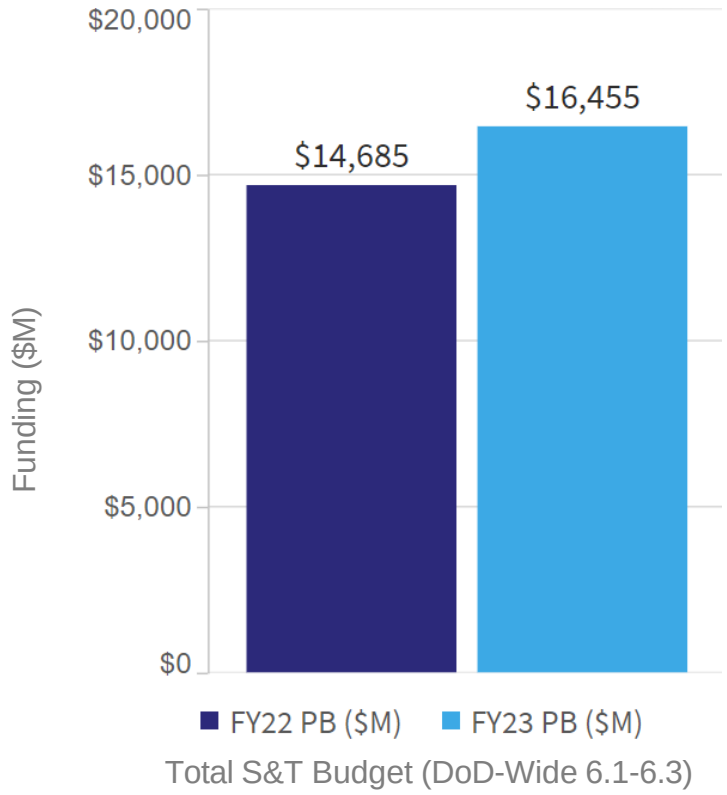


"Defense-Wide" refers to Total Fourth Estate

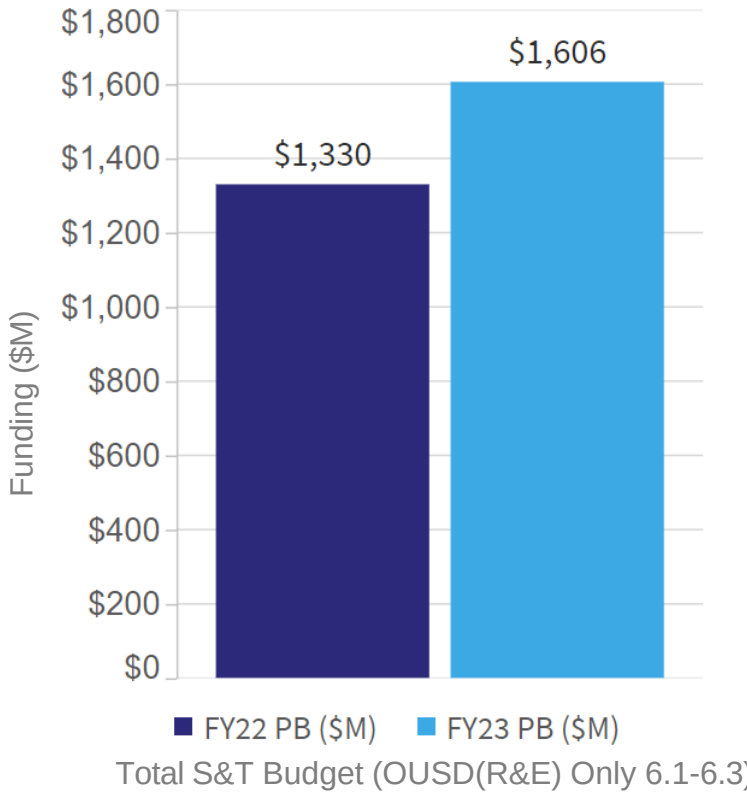
"DoD-Wide" includes Fourth Estate and Services

FY23 Total S&T Budget (6.1-6.3) – Up 12 % DoD-wide, 21% for OUSD(R&E)

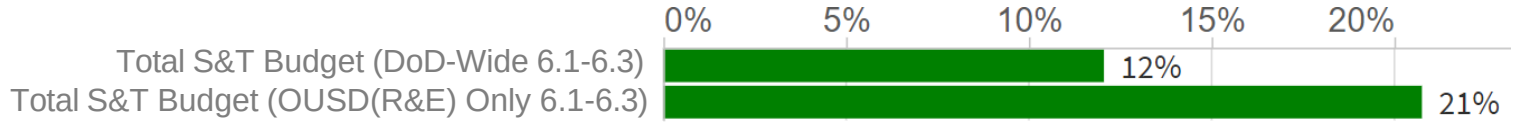
FY22 PB to FY23 PB
Total S&T Budget DoD-Wide Up by 12%



FY22 PB to FY23 PB
Total S&T Budget for OUSD(R&E) Up by 21%

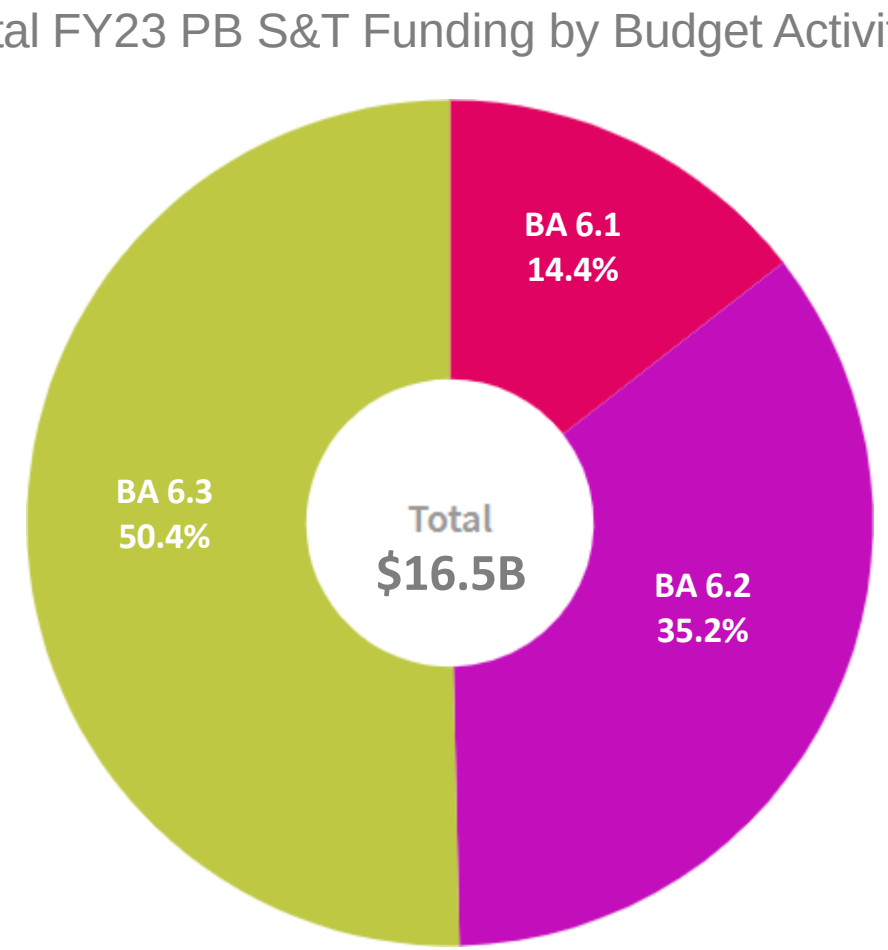


Percent Change



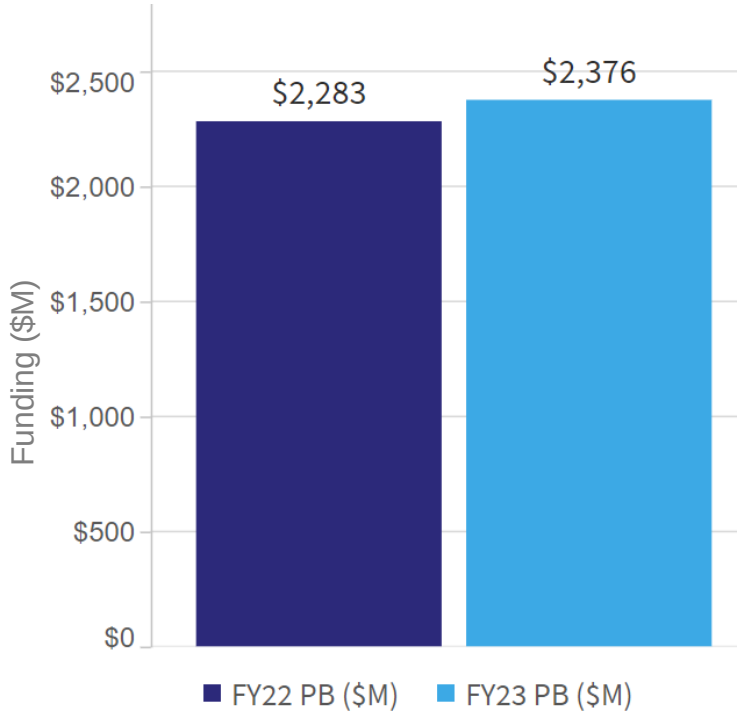
"OUSD(R&E)" includes Headquarters, DIU, TRMC, and DTIC

FY23 PBR DoD-Wide S&T Funding (6.1-6.3) – 13% of Total $130B FY23 PBR RDT&E



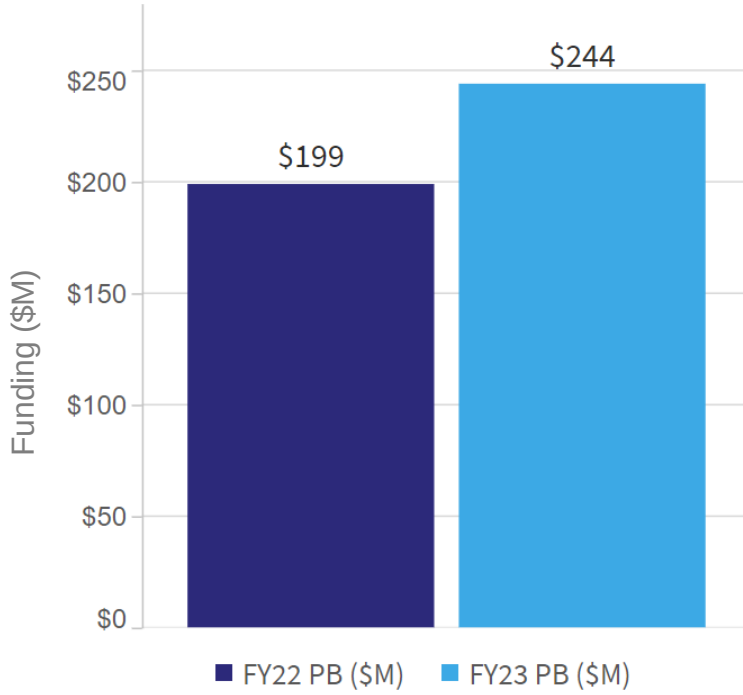
FY23 Total Basic Research Budget (6.1) – Up 4% DoD-wide, 23% for OUSD(R&E)

FY22 PB to FY23 PB
Total Basic Research Budget DoD-Wide Up by 4%



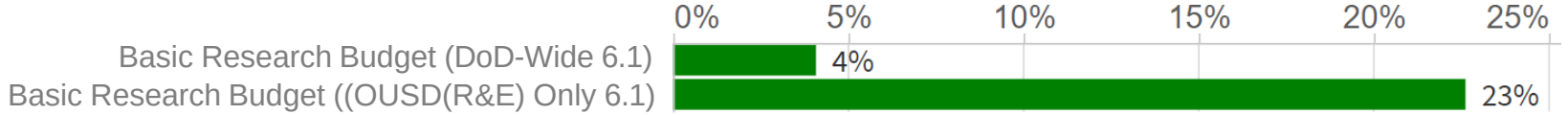
Basic Research Budget (DoD-Wide 6.1)

FY22 PB to FY23 PB
Total Basic Research Budget for OUSD(R&E) Up by 23%



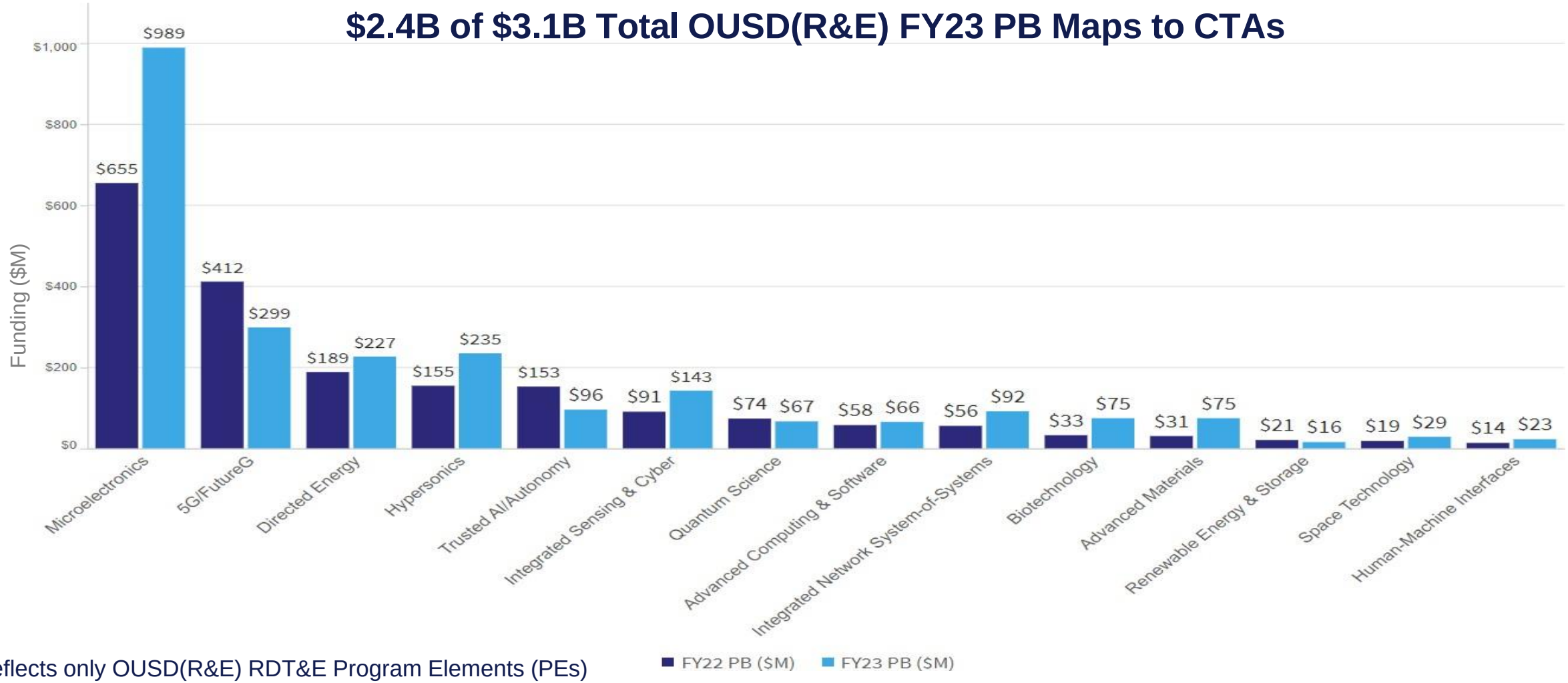
Basic Research Budget (OUSD(R&E) Only 6.1)

Percent Change



OUSD(R&E) Critical Technology Area (CTA) Investments for FY22 and FY23 PBs

FY22 PBR to FY23 PBR by CTA for OUSD(R&E) RDT&E (BA 6.1-6.6): $2.4B of $3.1B Total OUSD(R&E) FY23 PB Maps to CTAs

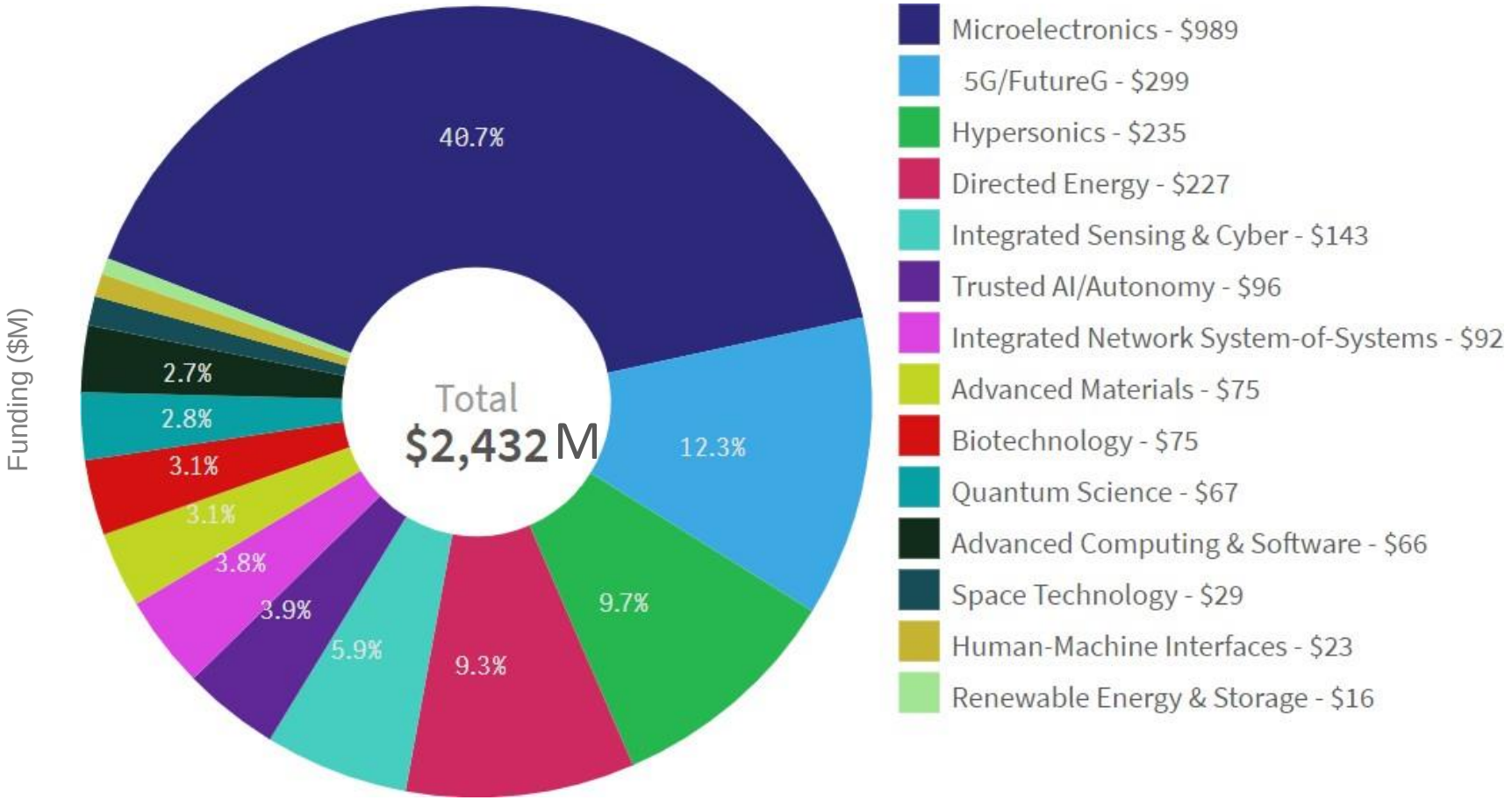


Reflects only OUSD(R&E) RDT&E Program Elements (PEs)

Reflects best estimates by OUSD(R&E) PE Program Managers of spend by CTA

OUSD(R&E) Critical Technology Area (CTA) Investments in FY23

FY23 PB OUSD(R&E) RDT&E Funding (BA 6.1-6.6) for CTAs: $2.4B of $3.1B Total OUSD(R&E) FY23 PB Maps to CTAs

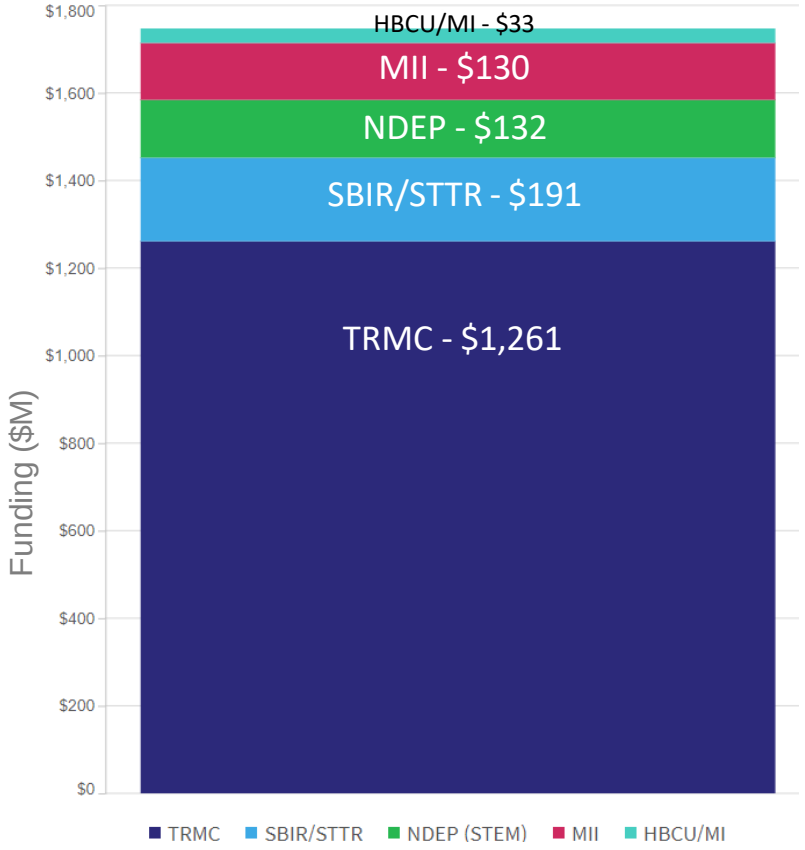


Reflects only OUSD(R&E) RDT&E Program Elements (PEs)

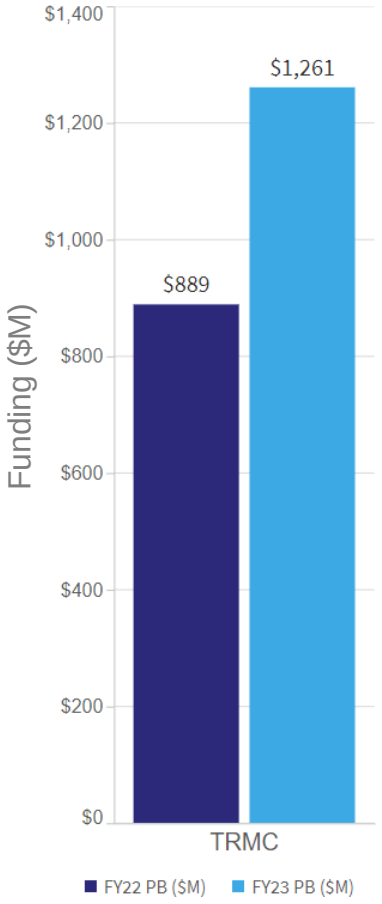
Reflects best estimates by OUSD(R&E) PE Program Managers of spend by CTA

Other OUSD(R&E) Strategic Investments in FY23

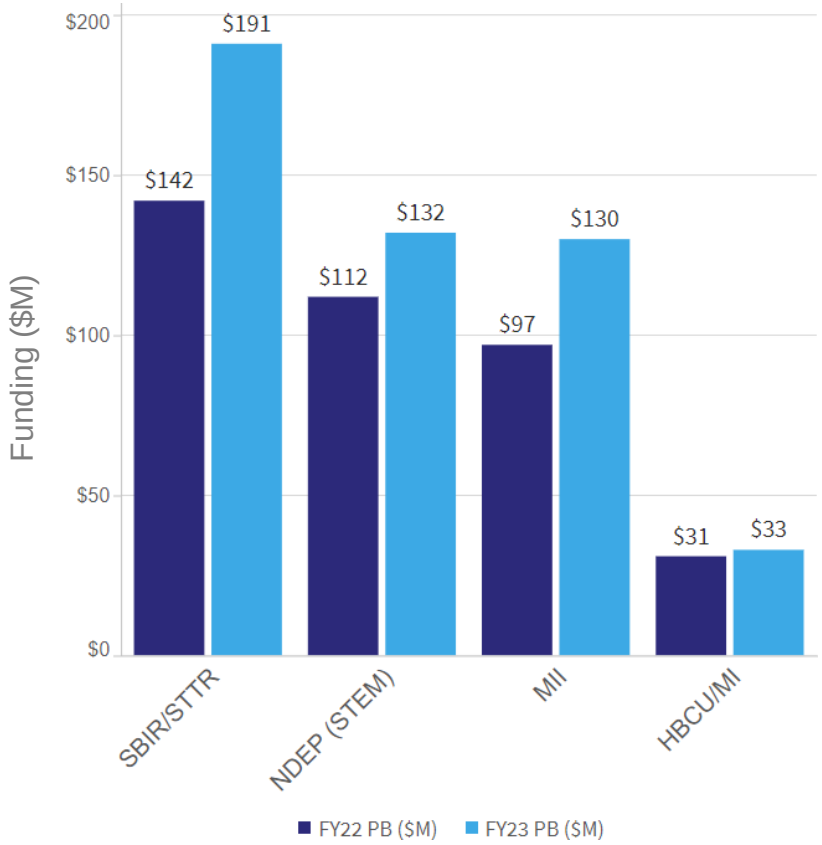
FY22 PBR to FY23 PBR by Other Strategic Investment for OUSD(R&E) RDT&E (BA 6.1-6.6):
$1.8B of $3.1B Total OUSD(R&E) FY23 PB



TRMC: FY22 to FY23 PB



Other R&E Investments: FY22 PB to FY23 PB



Reflects only OUSD(R&E) RDT&E Program Elements (PEs)

SBIR/STTR is an estimate for FY23 based on extramural research assumptions

OUSD(R&E) Vision Resources

USD(R&E) Memo on Strategic Vision and Critical Technology Areas, February 2:
https://www.cto.mil/wp-content/uploads/2022/02/usdre_strategic_vision_critical_tech_areas.pdf

Senate Armed Services Committee (SASC) Emerging Technologies and Capabilities Testimony, April 6:
https://www.dvidshub.net/video/837992/senate-committee-talks-innovation-posture-with-dod-leaders

For More Announcements and Opportunities, Visit OUSD(R&E) Website:
https://www.cto.mil/

Future of Naval Innovation

RADM Lorin C. Selby
Chief of Naval Research

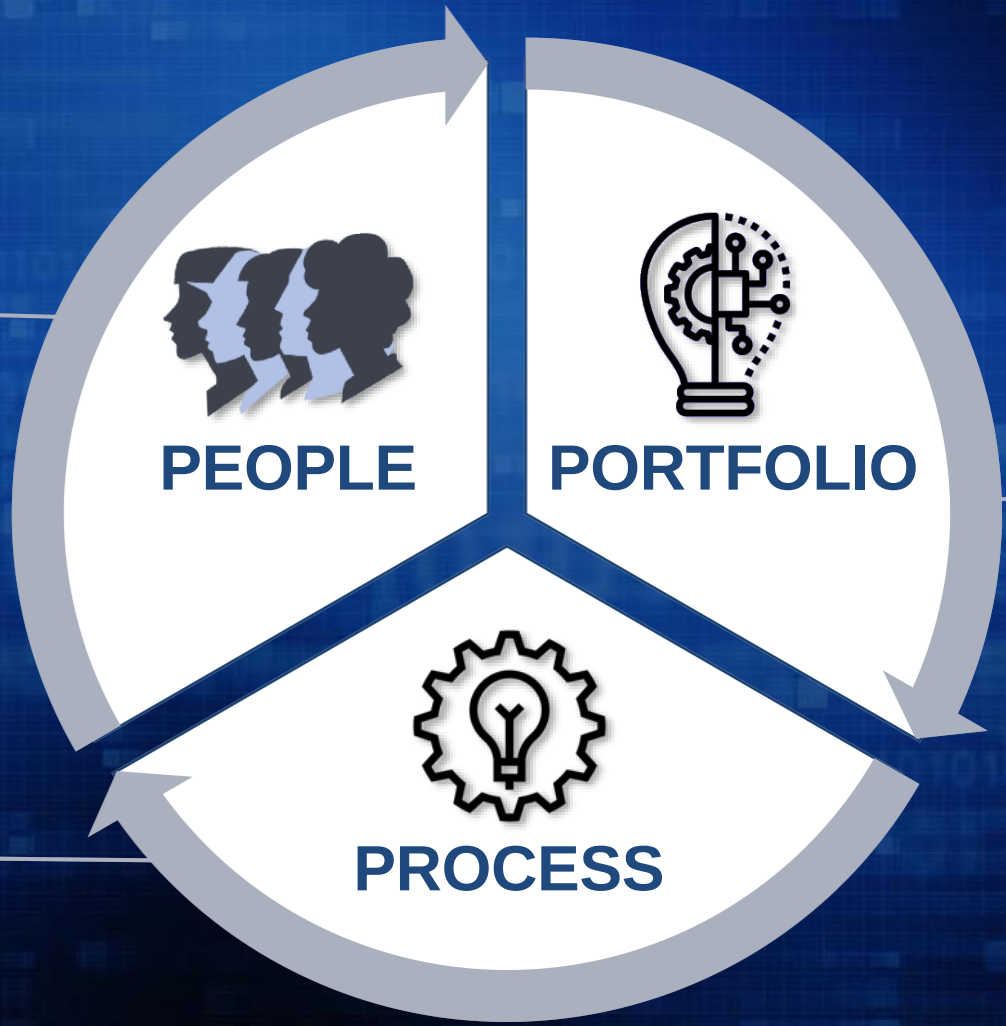
April 20, 2022

The Naval Research & Development Establishment (NR&DE)

The Naval Research Enterprise

FY22 Naval S&T Focus Areas

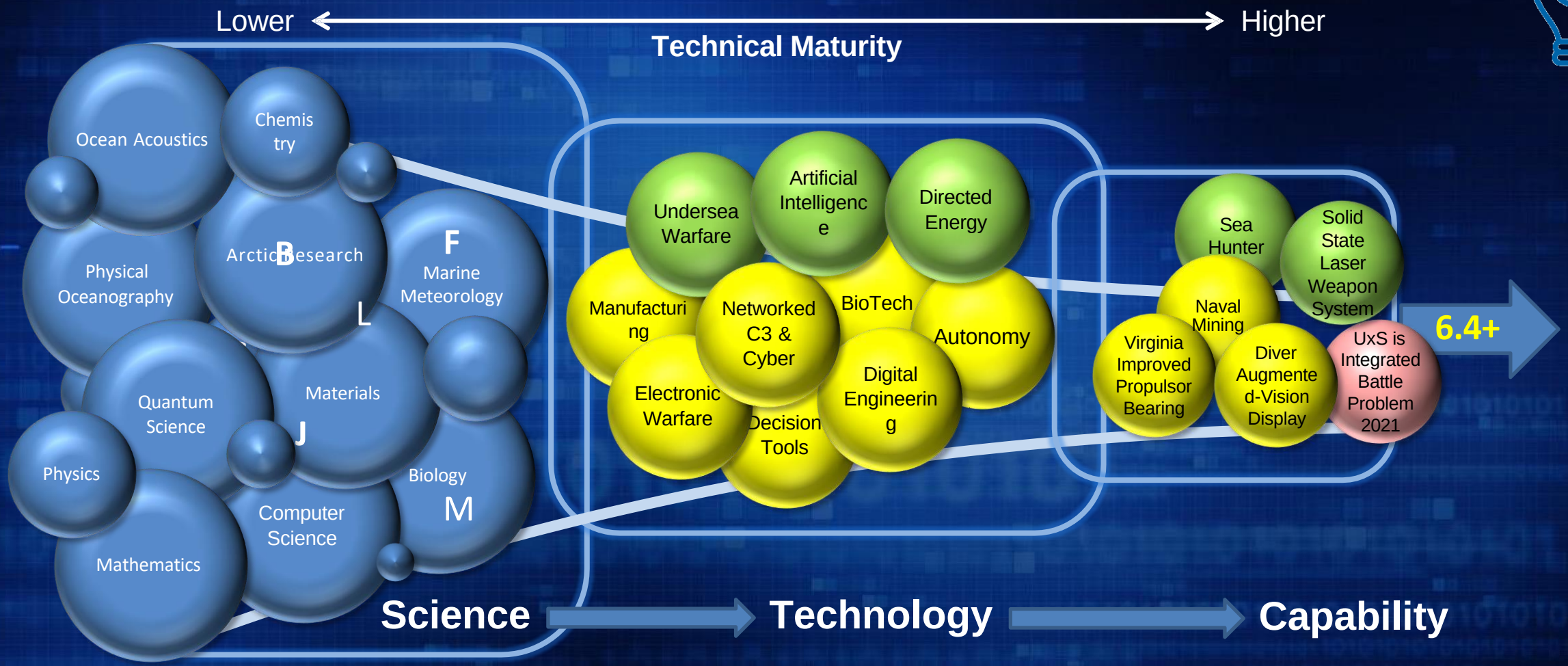
- STEM / HBCU MI / DEI
- Post-COVID Work Posture
- Modernize NRE Talent Management



- Execute SCOUT initiative
- Data Analytics, Modeling, Simulation, Experimentation & Analysis
- Global Engagement Plan
- Refine Corporate Leadership Processes

- Decision Superiority
- C4 and the Naval Operational Architecture
- AI/ML/Autonomy for ISR-T and Long Range Fires
- Power & Energy
- Hypersonics
- Undersea Warfare
- Materials and Manufacturing for small, many, cheap and lethal weapons
- LVC and Analytic Tools for training and readiness

NRE – Portfolio



- Basic and early Applied Research (BAR - 47%)
- Disruptive Technology (Innovative Naval Prototypes - 12%)
- Enabling Capabilities (Tech Candidates - 6%, Future Naval Capabilities - 12%, Tech Maturation - 17%; Total - 36%)
- Quick Reaction (Advanced Prototyping & Experimentation - 6%)

*Percentage of PB23

NRE – Portfolio Alignment

(PB23 - $2.65B)

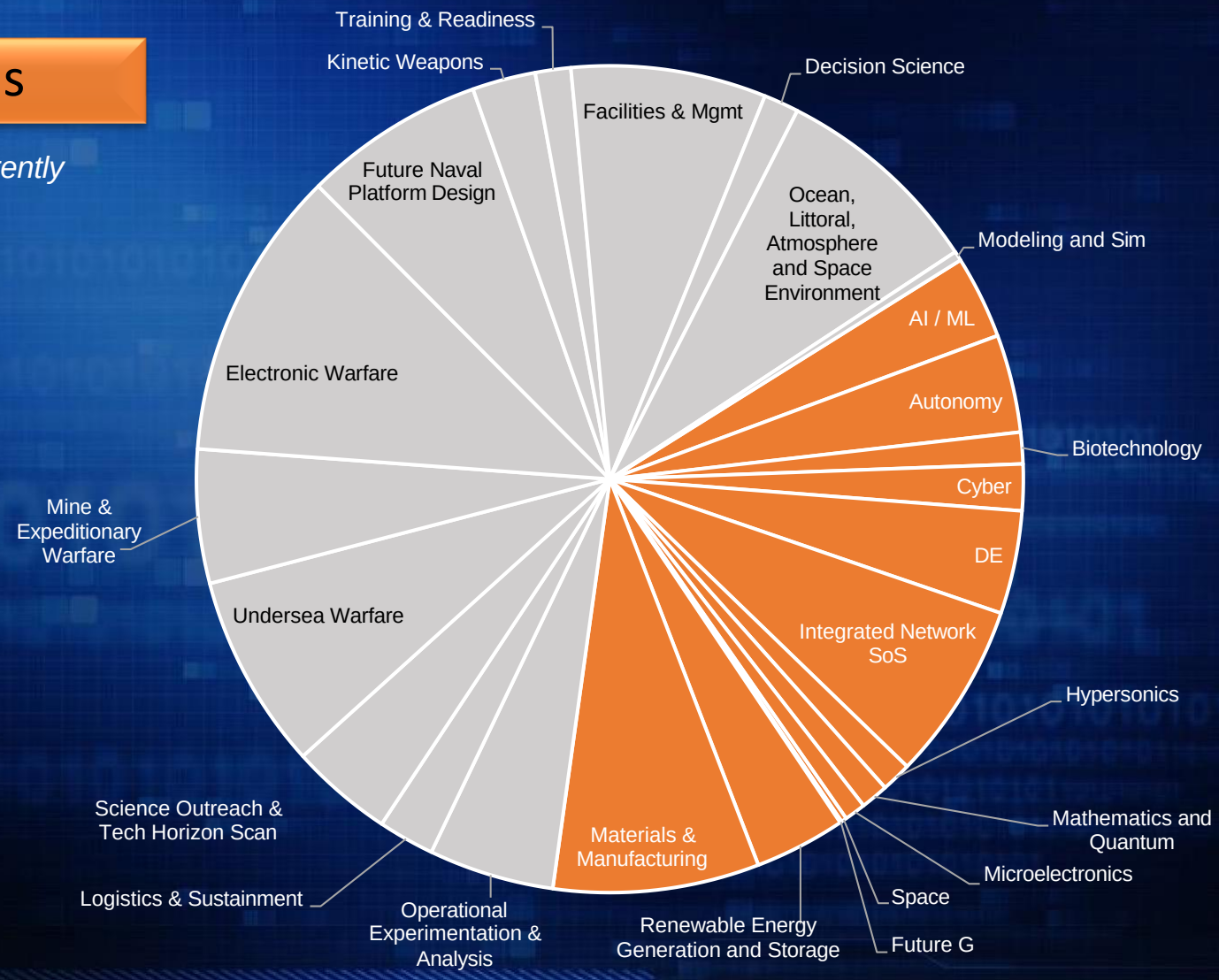
USD(R&E) Critical Technology Areas

Note: Full characterization of funding in these areas is currently incomplete:

- *Integrated Systems-of-Systems*
- *Advanced Computing and Software*
- *Human-Machine Interfaces*
- *Integrated Sensing*

Unique Naval Investments

- *Personnel and material readiness*
- *Experimentation & Analysis*
- *Naval Operational Architecture*
- *Logistics*
- *Terminal Defense*
- *Long Range Fires*
- *AI/UxS*
- *Affordability*

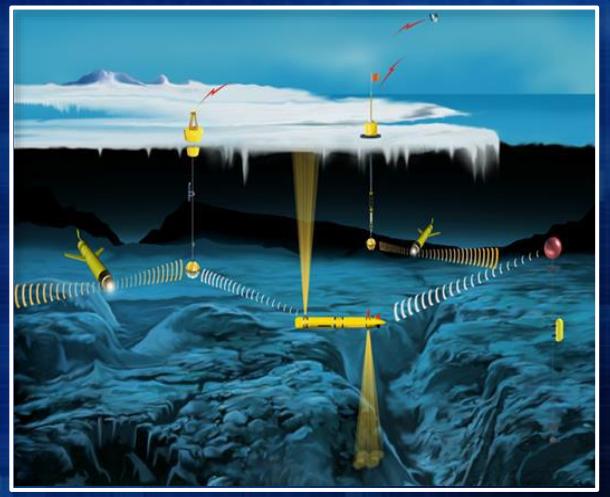


Naval S&T Examples

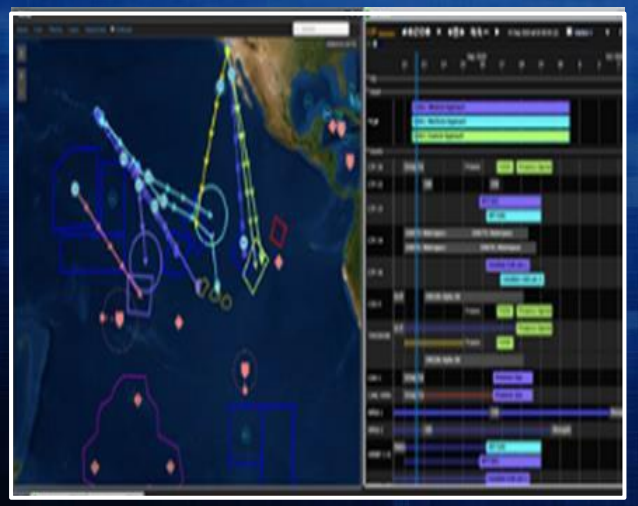
Landing Autonomous Navigation Technology for Enhanced Recovery to Navy Ships (LANTERNS)

Extended Range Directional Frequency Analysis & Recording (ER-DIFAR)

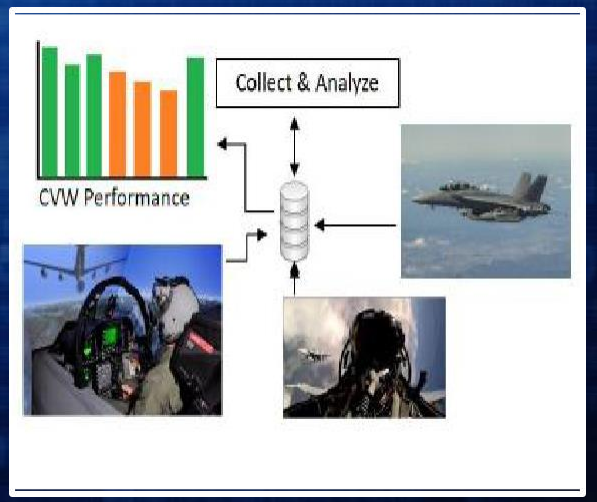
Layered Laser Defense (LLD)



Arctic Mobile Observing System (AMOS)



MINERVA



Fleet Adaptive Multilevel Measurement for Operations & Unit Systems (FAM2OUS)

Staying In Touch

www.onr.navy.mil

@USNavyResearch

@NavyCNR

Department of the Air Force

Integrity - Service - Excellence

Research and Development Support to DAF Capabilities

Kristen Baldwin, SES
Deputy Assistant Secretary
for Science, Technology & Engineering
(SAF/AQR)
April 2022

Strategic Drivers

2030 Strategy Objectives

- Develop and Deliver Transformational Strategic Capabilities
- Reform the Way Science and Technology is Led and Managed
- Deepen and Expand the Scientific and Technical Enterprise

AF Futures Design to Beat China:


CONNECT WITH THE JOINT FORCE


DOMINATE IN SPACE


GENERATE COMBAT POWER


CONDUCT LOGISTICS UNDER ATTACK

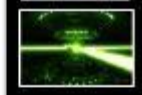
USSF S&T Priorities:


COMBAT POWER PROJECTION


INFORMATION MOBILITY


SPACE MOBILITY & LOGISTICS


SPACE DOMAIN AWARENESS


SPACE SECURITY

DAF Operational Imperatives

DEFINE RESILIENT SPACE ORDER OF BATTLE AND ARCHITECTURE

ACHIEVING OPERATIONALLY OPTIMIZED ADVANCED BATTLE MANAGEMENT SYSTEMS

DEFINE NEXT GENERATION AIR DOMINANCE SYSTEM OF SYSTEMS

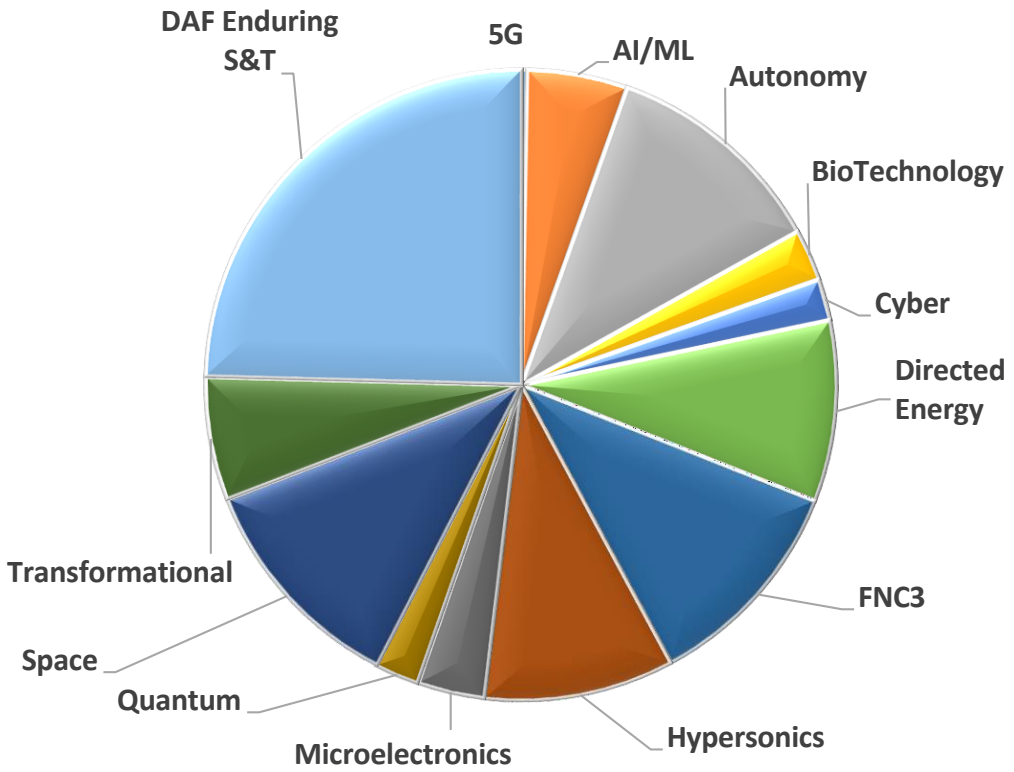
ACHIEVE MOVING TARGET ENGAGEMENT AT SCALE

DEFINING OPTIMIZED RESILIENT BASING, SUSTAINMENT, AND COMMUNICATIONS IN A CONTESTED ENVIRONMENT

DEFINE THE B-21 LONG RANGE STRIKE FAMILY OF SYSTEMS

EVALUATE READINESS OF THE DAF TO TRANSITION TO A WARTIME POSTURE

Modernization R&D Areas
DAF S&T Investment



DAF Enduring Science and Technology

- Munitions
- Turbine Engines
- Aircraft Power, Control & Thermal Management
- Low Cost Advanced Manufacturing Technology
- Next Generation Mobility
- Materials
- Sustainment Technologies
- Nuclear Systems
- Low Observable Technologies
- Non-descriptive Evaluation
- Rapid Response to Operations

FY23 President's Budget Request – DAF S&T	
Basic Research (6.1)	$550M
Applied Research (6.2)	$1,665M
Advanced Technology Development (6.3)	$931M

AF Office of Scientific Research Portfolio

Engineering and Complex Systems

- Dynamic Materials and Interfaces
- GHz-THz Electronics
- Energy, Combustion, and Non-Equilibrium Thermo
- Unsteady, Aerodynamics and Turbulent Flows
- Aerospace Composite Materials
- Multiscale Structural Mechanics & Prognosis
- Propulsion and Power
- Agile Science of Test and Evaluation
- High-Speed Aerodynamics

Information and Networks

- Computational Cognition and Machine Intelligence
- Computational Mathematics
- Dynamical Systems and Control Theory
- Dynamic Data and Information Processing
- Information Assurance and Cybersecurity
- Mathematical Optimization
- Information, Computations, Learning, and Fusion
- Trust and Influence
- Complex Networks
- Cognitive and Computational Neuroscience

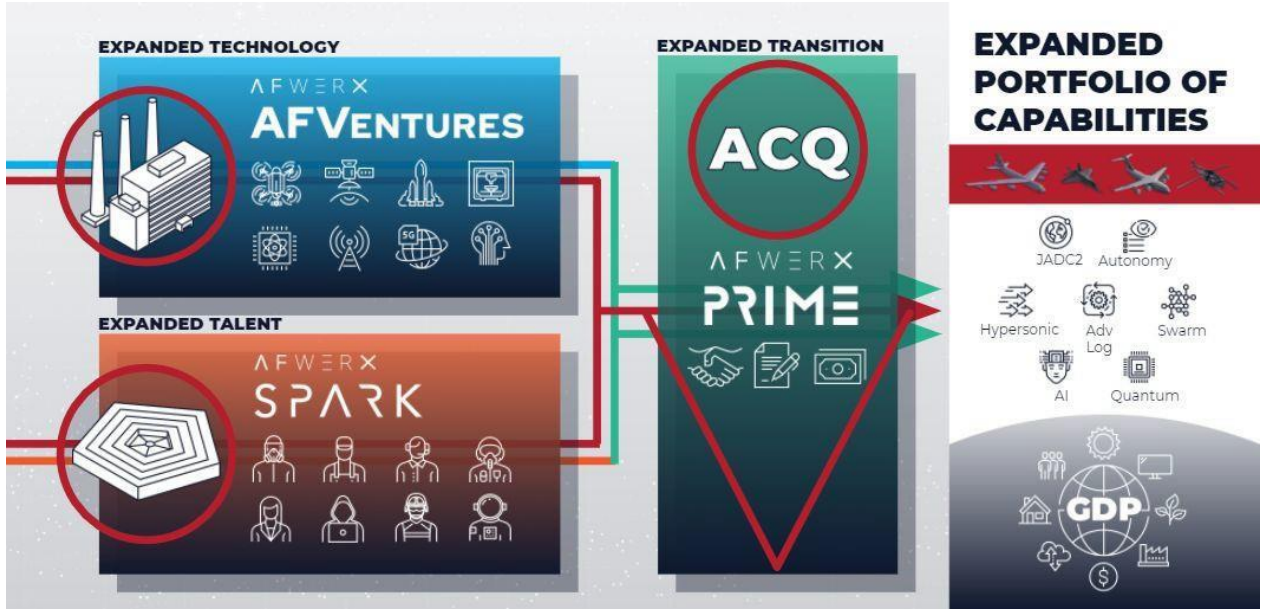
Physical Sciences

- Aerospace Materials for Extreme Environments
- Atomic and Molecular Physics
- Electromagnetics
- Laser and Optical Physics
- Optoelectronics and Photonics
- Plasma and Electro-Energetic Physics
- Quantum Information Sciences
- Physics of Remote Sensing
- Space Science
- Ultrashort Pulse Laser-Matter Interactions
- Condensed Matter Physics

Chemistry and Biological Sciences

- Biophysics
- Human Performance and Biosystems
- Mechanics or Multifunctional Materials and Microsystems
- Molecular Dynamics and Theoretical Chemistry
- Natural Materials and Systems
- Organic Materials Chemistry

AFWERX Structure and Resources



Program Element	FY21 ($M)	FY22 ($M)
DAF SBIR/STTR[1] (PE:65502F-Air, C5502S-Space)	$919.2[2]	$937.6[3]

SpaceWERX is the newest innovation arm, focused on pursuing novel technologies for the USSF

Approximately 1,400 contract awards per year

[1] Small Business Innovation Research/Small Business Technology Transfer
[2] FY21 DAF Small Business Innovation funds ($256.9M in USSF PE)
[3] SBIR/STTR calculation is unknown until end of each fiscal year

Capability Development Planning to Bridge the "Gap"

Example: Skyborg Vanguard

Science and Technology

•Focused on demonstrating an Autonomy Core System (ACS) that is portable, modular and adaptable

- Open missions systems, DevSecOps and digital engineering are key program tenets

Experimentation and Prototyping

•Assess ability to aviate, navigate, and communicate

- Assess maintenance and lifecycle costs
- Develop system integration lab and simulation infrastructure
- Develop CONOPS
- Assess training, doctrine, policy and safety concerns

PEO

- Strong partnership enables tech transition and MAJCOM advocacy
- Tech maturation informs acquisition strategy

HAF/MAJCOM

- Capability development charter
- Requirements
- POM advocacy

Coordinated Investments to Enable Rapid Technology Transition

Three-Pronged Approach to Staying Engaged

Solicit Industry Ideas	Inform Industry IR&D	Maintain Continuous Dialogue
Offer Periodic Opportunities Supporting Specific Initiatives	*Share Strategic Drivers & Concepts Being Explored*	*Provide Updates As They Occur And Participate In Industry Events*
SAM.GOV®	Defense Innovation Marketplace	
AFWERX CHALLENGE	Strategy Interchange Meetings	AFResearchLab.com
SBIR · STTR America's Seed Fund	DAYTON DEFENSE Dayton Area Defense Contractors Association	Press Releases & Social Media
	Classified Threat Briefs	
	Classified Future Concept Briefs	
		AFA Attend Industry Conferences

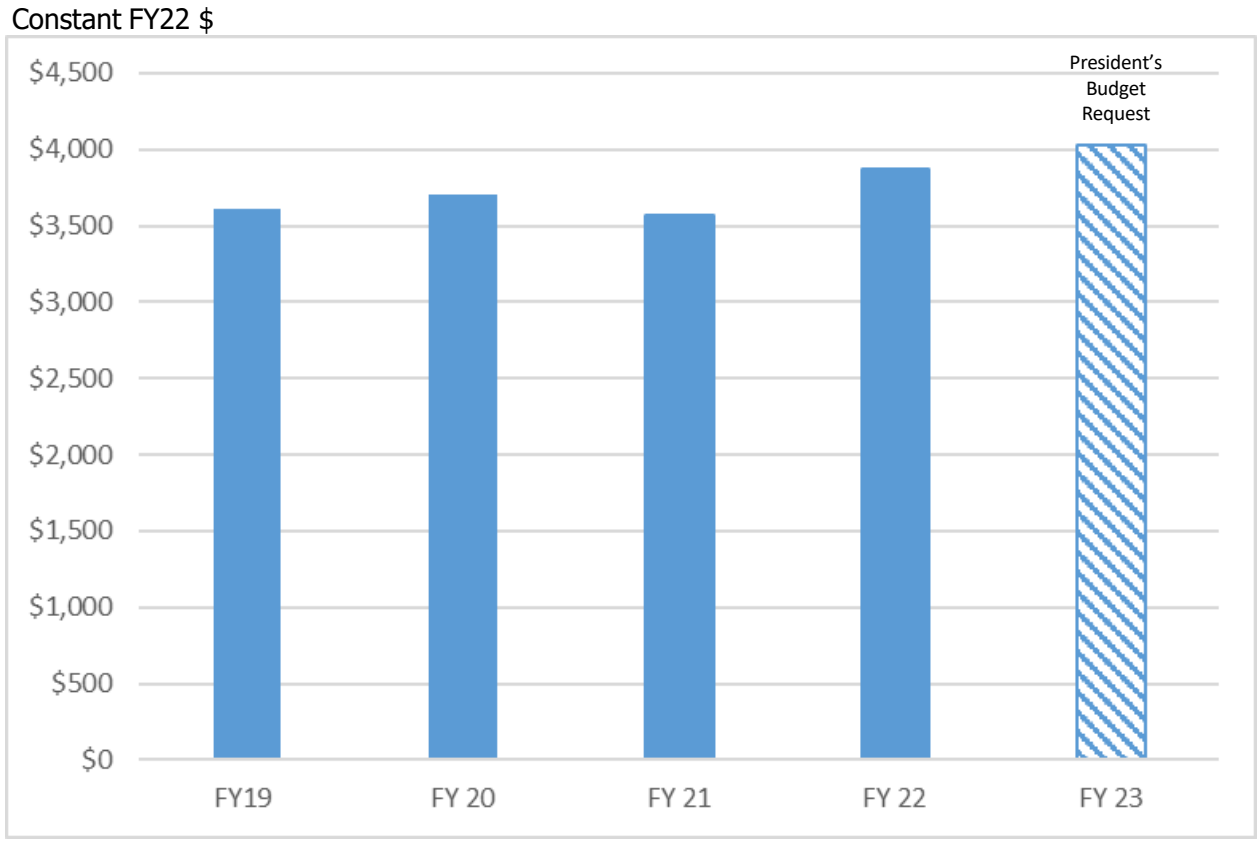
Defense Advanced Research Projects Agency

Stefanie Tompkins, Ph.D.
Director

R&E Budget Rollout Webinar

April 20, 2022

DARPA's Budget



Example FY23 Investment Areas

- Microelectronics: $896M
- Biotechnology: $414M
- Artificial Intelligence: $412M
- Cyber: $184M
- Hypersonics: $143M
- Quantum: $90M
- Space: $82M

92% of funding to projects

67% to industry

17% to universities

25% of total DoD S&T funding

PREVENT AND IMPOSE TECHNOLOGICAL SURPRISE

Create New Options for National Security Leaders

For All Domains

Space • Air • Land • Sea • Subsurface
Virtual • Electromagnetic • Social

Example Portfolios

- Assault Breaker II
- Distributed Complex Systems
- Gray Warfare
- Electronics Resurgence Initiative
- Long Range Effects
- Climate & Environment
- "AI Next" Campaign
- Warfighter Protection & Performance
- "In Silico"
- Resilient Supply Chains
- Cyber
- Transition & Business

Foundations for Technological Surprise

Biotechnology • Complexity • Chemistry • Data Science
Human-Machine Symbiosis • Interoperability • Machine Learning
Materials • Microelectronics • Quantum • Social Science …

Embedded Entrepreneurship Initiative

https://eei.darpa.mil/

Transition Support to DARPA PMs and Performers to Propel National Security Innovations to Market

What:

- Entrepreneurs paired with DARPA research teams
- Techno-economic market mapping analyses
- Mentoring
- Connections to U.S. investors and corporations

Who:

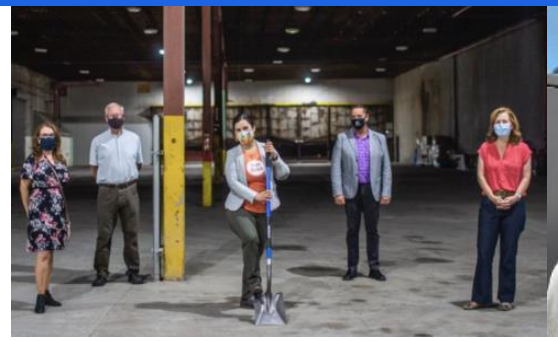
- DARPA with SETA support from IQT Emerge.™ Reputation, Experience, Networks.

iqt EMERGE™

Results To-Date:

- **34** venture rounds closed
- **$281M** in U.S. venture capital raised
- **$70M** in government funding raised
- **19** joint development agreements and licensing deals with corporations
- **>100** top-tier U.S. investors in DARPA's Transition Working Groups
- **18** new manufacturing sites
- **15** companies selling product
- **$0** problematic foreign investment raised

LIGHTDECK



www.darpa.mil


Office of the Assistant Secretary of the Army
Acquisition, Logistics and Technology
Army Science and Technology
PB23 Budget Overview
20 April 2022
DESIGN • DEVELOP • DELIVER • DOMINATE
SOLDIERS AS THE DECISIVE EDGE

Army S&T Investments: PB23 - $3.3B (FY23)

As of PB23 AF3.1

Other S&T Programs

HPCMP

- High Performance Computing Modernization Program (DoD), Procurement

Basic Research

- Materials Science; Quantum/Info Science; AI, Autonomy & Robotics; Networks; Synthetic Biology, Biotech & Life Sciences; Training/Human Sciences; Neuroscience

Manufacturing Technology

Innovation Technology

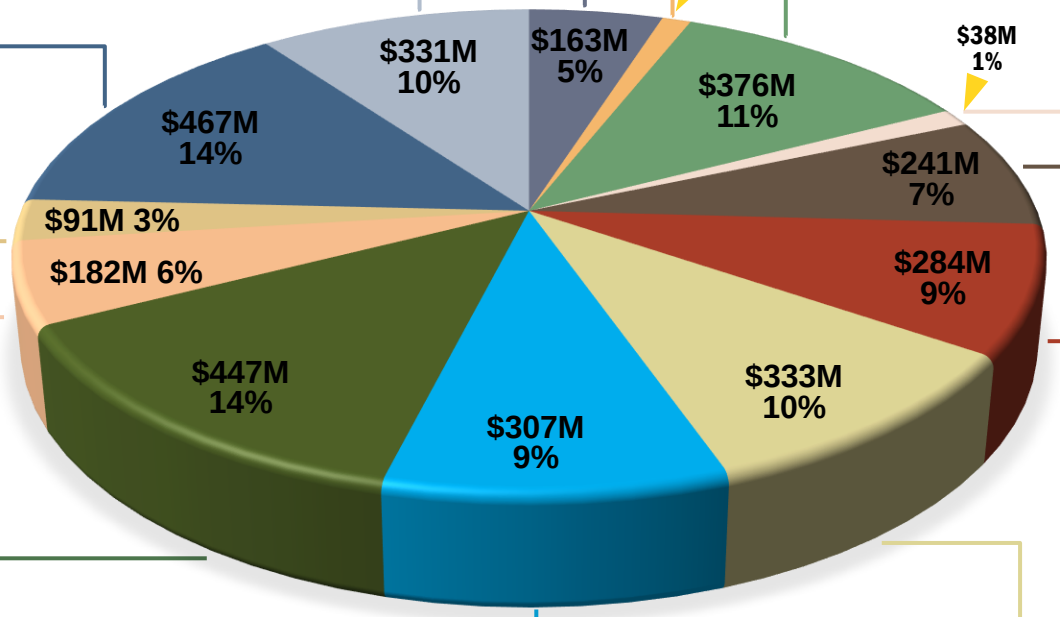
- University Technology Development Directorate, Army Applications Lab, AI Center, Sensor-Shooter Integration, Advancing Concepts & Tech Forecasting, Counter Explosive Hazards

Ground Technology

- NGCV Lethality
- NGCV Robotics and Autonomy
- NGCV Armor and Active Protection
- NGCV Platforms, Electrification and Mobility
- Ground Enabling Technology

Aviation Technology

- Platform Development and Demonstration
- Power and Propulsion Systems
- Maintainability and Sustainability
- Aviation Concept Design and Assessment
- Integrated Mission Systems



Army S&T BA	FY23
6.1	$467M
6.2	$884M
6.3	$1,392M
6.4	$392M
6.6	$35M
6.7	$91M
Procurement	$74M

Management Support

- Technical Information Activities

Maturation and RDER

- Technology Maturation Initiatives (TMI)
- Army Experimentation and Prototyping

Air and Missile Defense

- Smaller & Cheaper Missiles
- High Energy Lasers
- Gun Based Counter-Tactical & Small UAS
- Advanced Seekers
- Advanced Energetics & Propulsion
- Radars

Lethality Technology

- Propulsion for Extended Range Missiles
- Extended Range Cannon Artillery
- Enhanced Guidance/Navigation for Weapons
- Advanced Energetics
- Advanced Warheads for Cluster Munitions

Network

- Tactical Communications
- Mission Command
- Cyber Electromagnetic Activities
- Assured Position, Navigation & Timing
- Persistent ISR

Soldier

- Soldier-borne Interfaces, Integration, and Power
- Situational Awareness, Small Arms, and Protection
- Synthetic Training Environment (STE)
- Personnel Research
- Biotech for Resilient Supply Chain and Materials

Army S&T Enterprise PB23 FY23

Army Major Commands: 4 | Army Laboratories: 11 | Army Civilian S&Es: 13,000 | Army Civilian S&E Degrees: PhD, BS, MS

ARMY MODERNIZATION PRIORITIES

As of PB23 AF3.1

Long Range Precision Fires

Strategic Fires	• 1 projects • $36.5M
Operational Fires	• 6 projects • $52.6M
Tactical Fires	• 7 projects • $54.8M

Next Generation Combat Vehicle

Lethality	• 3 projects • $17.3M
Robotics and Autonomous Systems	• 12 projects • $147.3M
Armor and Active Protection	• 8 projects • $120.5M
Ground Vehicle Platforms	• 5 projects • $82.3M

Future Vertical Lift

FVL CS1 (Attack Recon)	• 5 projects • $37.7M
Future Unmanned Aircraft System	• 4 projects • $67.6M
Modular Open Systems Approach	• 8 projects • $125.0M
FVL CS3 (Long Range Assault)	• 4 projects • $16.9M

Network

Unified Network	• 20 projects • $133.9M
Common Operating Environment	• 12 projects • $43.4M
Command Post	• 3 projects • $25.5M
Assured PNT	• 3 projects • $21.2M
Navigation Warfare	• 2 projects • $4.0M
Space	• 2 projects • $16.6M

Air & Missile Defense

Indirect Fire Protection Capability	• 2 projects • $9.2M
Maneuver – Short Range Air Defense (M-SHORAD)	• 2 projects • $15.2M
Sensors & Other	• 4 projects • $13.8M

Soldier Lethality

Lethality	• 4 projects • $22.6M
Situational Awareness	• 4 projects • $51.0M
Protection	• 2 projects • $4.8M
Survivability	• 7 projects • $42.8M
Mobility	• 3 projects • $10.5M
Human Performance/ Training	• 5 projects • $21.7M
Synthetic Training Environment	• 5 projects • $51.3M
Personnel Research & Talent Management	• 2 projects • $35.2M

ENABLING

- Energetics & Propulsion
- Lethality & Warheads
- Armament Technology
- Hypersonic Technology

• 10 projects
• $68.4M

- Force Projection
- Force Protection
- Autonomy & AI
- Materials
- Power & Energy

• 21 projects
• $85.4M

- Platform Design
- Aircraft Survivability
- Powertrain & Propulsion
- Aircraft Mission Systems
- Unmanned Systems & Autonomy

• 19 projects
• $59.5M

- Network Resiliency
- Cyber Defense
- Electronic Warfare

• 14 projects
• $40.6M

- Solid State Laser Tech
- Radar Technology

• 3 projects
• $29.1M

- Intelligent Weapons
- Soldier Power & Energy
- Training and Performance Tech
- Adaptive AI for SA and Enhanced Decision Making
- Adv Concepts and Tech Forecasting

• 8 projects
• $16.2M

CROSS-CUTTING

Basic Research / Army Priority Research Areas

- Disruptive Energetics
- RF Electronic Materials
- Quantum
- Hypersonic Flight
- Artificial Intelligence
- Autonomy
- Synthetic Biology
- Material by Design
- Science of Additive Manufacturing

Outreach:

- Army Educational Outreach Program / STEM
- HBCU/MSI

• 19 projects
• $466.8M

Army Priority Crosscutting

Army Agile Innovation and Demonstration	• 3 project • $23.0M
All Domain Convergence	• 5 projects • $72.9M
Artificial Intelligence and Machine Learning Tech	• 10 projects • $22.8M
Innovation Enablers	• 1 project • $7.5M

Transition and DOD Programs

Technology Maturation, RDER, Counter Explosive Hazards (BA 6.4)	• 6 projects • $391.6M
Manufacturing Technology (BA 6.7)	• 1 project • $91.3M
High Performance Computing Modernization Program (BA 6.3, OPA)	• 2 projects • $325.6M
Counter Explosive Hazards (BA 6.2, BA 6.3) (Briefed in Ground)	• 3 projects • $36.6M
Biotechnology (BA 6.2, BA 6.3) (Briefed in Soldier)	• 2 projects • $78.8M

*Army S&T Enterprise Budget Total also includes $35M Management Support and $163M Other S&T

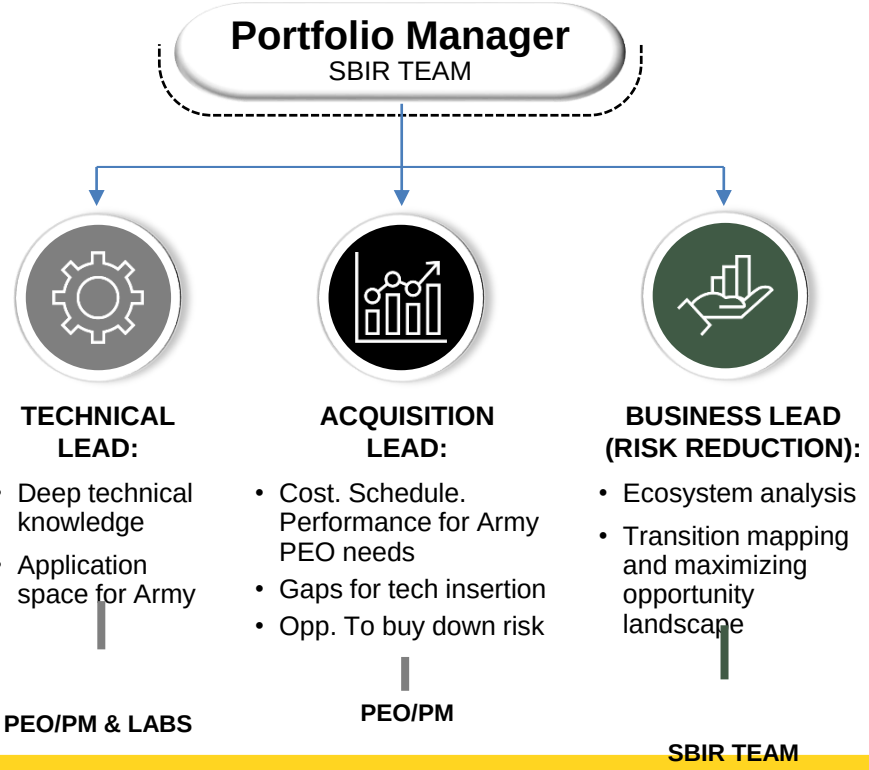
Army SBIR & STTR: Transition-Focused Broker Teams

U.S. ARMY SBIR | STTR https://www.armysbir.army.mil/

VALUE STREAM

- Balanced risk portfolio linking Army needs to the **agility and innovation** of American firms
- Maximize effectiveness and impact of SBIR funds to **reduce technical and execution risk** in Army Acquisition programs
- Multidisciplinary team (acquisition, technology, American innovation economy representation) yields rapid and effective **information transfer** and mutual learning to **enhance enterprise-wide SBIR fund allocation decisions**

MEMBERSHIP



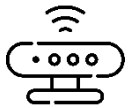
TECHNOLOGY FOCUS AREAS

Strategic investment in domains with: Confluence of Army technical applications, unrivaled private sector expertise, and high potential for commercial sector growth.

Autonomy
$30M


AI / ML
$70M


Wearables & Immersive
TBD

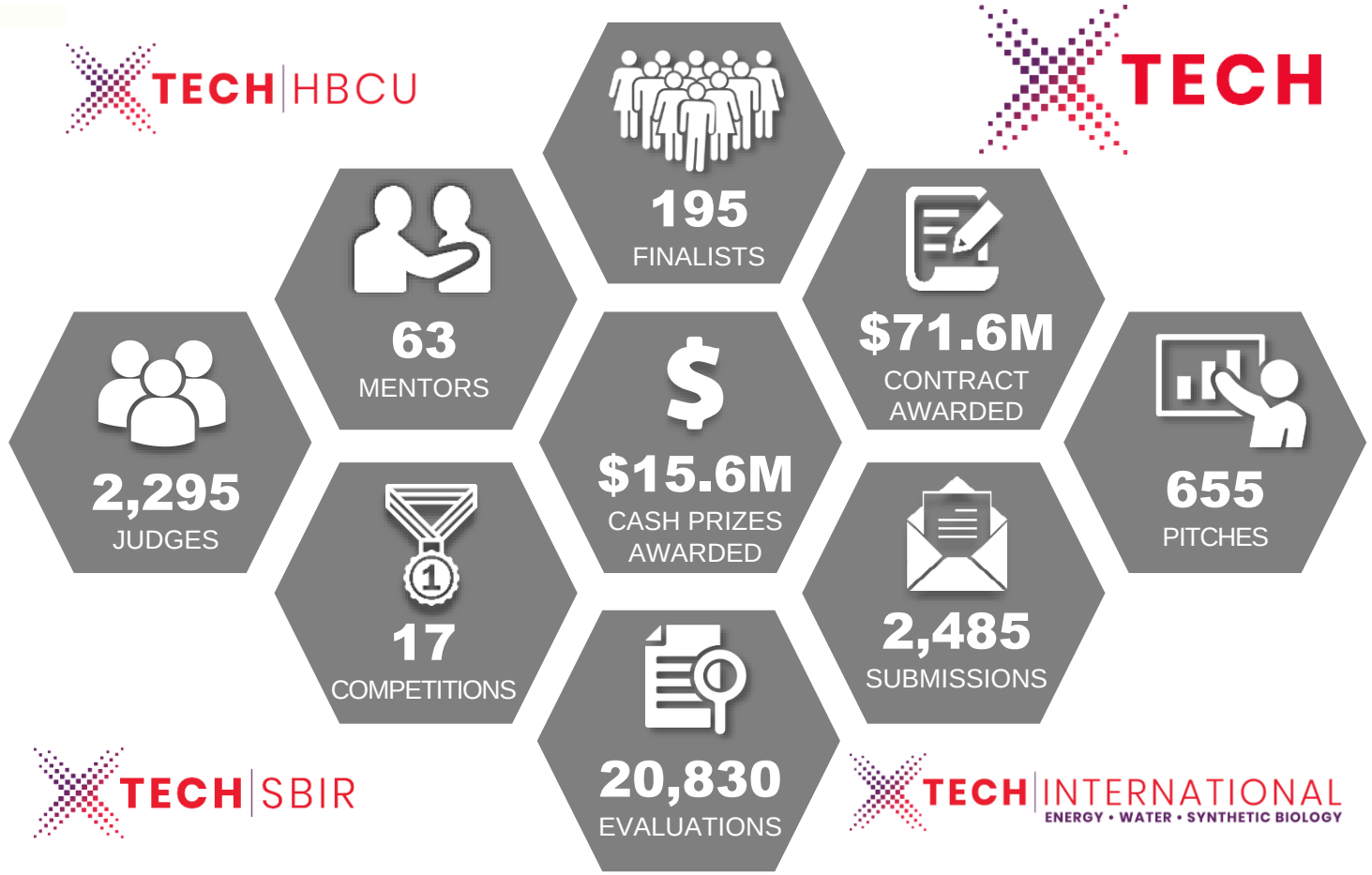

SMART Sensors
$44M


Climate & Energy Tech
$25M

Fundamental Tenet: Culture shift from passive, topic-driven portfolio to strategic synchronization and integration of Transition Broker Teams focusing on Army and PEO-relevant capability gaps, technology insertion points, and milestone decision opportunities

US Army Expeditionary Technology (xTech) Prize Competition

- Prize competition founded in 2018 to incentivize and break-down barriers for non-traditional innovators to engage and understand how to do business with the Army
- xTech impacts:
  - Promoting early Army influence **to accelerate dual-use technology transitions**
  - Staying current on technology developments in the U.S. innovation base
  - **Growing the ecosystem** of non-traditional innovators and increasing collaboration across the S&T, Advanced Development and user communities
  - Streamlined approach for **multidisciplinary evaluations, comprehensive and transparent feedback, and rapid capital to industry and academia**
  - **Technology accelerator** for non-traditional, deep-tech startups for networking, mentorship and engagements to demystify working with the Army



https://www.arl.army.mil/xtechsearch/