



# Understanding the Department of Defense's Engineering Workforce

**Aileen Sedmak**

**Office of the Deputy Assistant Secretary of Defense  
for Systems Engineering**

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Springfield, VA | October 29, 2015**



# DASD, Systems Engineering Mission



## **Systems Engineering focuses on engineering excellence – the creative application of scientific principles:**

- To design, develop, construct and operate complex systems
- To forecast their behavior under specific operating conditions
- To deliver their intended function while addressing economic efficiency, environmental stewardship and safety of life and property

***DASD(SE) Mission: Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected acquisition programs.***

**A Robust Systems Engineering Capability Across the Department Requires Attention to Policy, People and Practice**

- ***US Department of Defense is the World's Largest Engineering Organization***
- ***Over 108,000 Uniformed and Civilian Engineers***
- ***Over 39,000 in the Engineering (ENG) Acquisition Workforce***



# DASD, Systems Engineering



 **DASD, Systems Engineering**  
**Stephen Welby**  
**Principal Deputy Kristen Baldwin** 

 **Major Program Support**  
**James Thompson**

*Supporting USD(AT&L) Decisions with Independent Engineering Expertise*

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Assessments
- Overarching Integrated Product Team and Defense Acquisition Board Support
- Systems Engineering Plans
- Systemic Root Cause Analysis
- Development Planning/Early SE
- Program Protection

 **Engineering Enterprise**  
**Robert Gold**

*Leading Systems Engineering Practice in DoD and Industry*

- Systems Engineering Policy and Guidance
- Technical Workforce Development
- Specialty Engineering (System Safety, Reliability and Maintainability, Quality, Manufacturing, Producibility, Human Systems Integration)
- Security, Anti-Tamper, Counterfeit Prevention
- Standardization
- Engineering Tools and Environments

**Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs**



# Why Engineering is Important to the DoD Mission



- **Department of Defense develops and delivers to our soldiers, sailors, marines, and airmen incredibly effective but increasingly complex weapon systems to ensure technological superiority over our adversaries**
- **Engineers play a vital role in fielding high-quality, affordable, supportable, and effective defense systems to sustain and advance America's military dominance**
  - Evolving and verifying an integrated, total life cycle balanced set of systems, people, and process solutions that satisfy the customer's needs and meet department affordability goals
  - Requires technical competency, critical and strategic thinking, knowledge of various product domains, and knowledge of other engineering disciplines to develop innovative technologies that maximize our strengths and exploit the weaknesses of potential adversaries
- **DoD Engineers**
  - Help program managers identify and mitigate risks
  - Shape DoD technical planning and management
  - Support knowledge-based decision making
  - Provide technical depth of acquisition policy and processes
  - Provide a balanced solution for affordable and capable systems



# DoD at a Strategic Crossroads



**Dr. Ashton Carter**  
**FY16 Posture Statement,**  
**Senate Armed Services**  
**Committee, March 3**

***“DoD is addressing the erosion of U.S. technological superiority with the Defense Innovation Initiative (DII). The DII is an ambitious Department-wide effort to identify and invest in innovative ways to sustain and advance America’s military dominance for the 21st century...the ultimate aim is to help craft ‘offset strategies’ that maximize our strengths and exploit the weaknesses of potential adversaries.”***



# Building the Force of the Future



Secretary of Defense Ash Carter

Submitted Statement -- Senate Appropriations Committee-Defense (Budget Request), May 06, 2015

**“We have inherited a long tradition of military excellence from those who came before us, and we must preserve it for those who will come after.**

**But to do so, DoD must embrace the future – and embrace change – throughout our institution. We at the Pentagon must, as I say, think outside our five-sided box, and be open to new ideas and new ways of doing business that can help us operate more efficiently and perform more effectively in an increasingly dynamic and competitive environment.**

**As DoD counters the very real dangers we face in the world, we will also grab hold of the bright opportunities before us – opportunities to be more competitive and re-forge our nation’s military and defense establishment into a future force that harnesses and develops the latest, cutting-edge technology, and that remains superior to any potential adversary; one that is efficient and accountable to the taxpayers who support it; and one that competes and succeeds in attracting the next generation of talented Americans to fill its ranks.”**

**#ForceoftheFuture**

**Be a part of it.**



[http://www.defense.gov/home/features/2015/0315\\_force-of-the-future/](http://www.defense.gov/home/features/2015/0315_force-of-the-future/)



# USD(AT&L) Released BBP 3.0

## Achieving Dominant Capabilities through Technical Excellence and Innovation





ACQUISITION,  
TECHNOLOGY,  
AND LOGISTICS

**UNDER SECRETARY OF DEFENSE**  
3010 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3010

APR 09 2015

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS  
DEPUTY CHIEF MANAGEMENT OFFICER  
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER  
DIRECTORS OF THE DEFENSE AGENCIES  
AT&L DIRECT REPORTS

**SUBJECT:** Implementation Directive for Better Buying Power 3.0 – Achieving Dominant Capabilities through Technical Excellence and Innovation

Almost five years ago, then-Under Secretary Carter and I launched the first iteration of what we called Better Buying Power. Today I am issuing the attached implementing instructions for Better Buying Power 3.0. This iteration of Better Buying Power is the next step in our continuing effort to increase the productivity, efficiency, and effectiveness of the Department of Defense's many acquisition, technology, and logistics efforts.

There is more continuity than change in Better Buying Power 3.0. Core initiatives focus on: ensuring that the programs we pursue are affordable, mandating that our managers identify and pursue "should cost" savings opportunities, providing effective incentives to industry, emphasizing competition, reducing bureaucracy, improving our acquisition of contracted services, and building our professionalism. We will continue all of these efforts.

New in Better Buying Power 3.0 is a stronger emphasis on innovation, technical excellence, and the quality of our products. The technological superiority of the United States is now being challenged by potential adversaries in ways not seen since the Cold War. Efficiency and productivity are always important, but the military capability that we provide to our Warfighters is paramount. Our operational effectiveness is based on the quality of our people and the quality of our products. The former is not in doubt; the latter depends on our efforts and on those of the industrial base. We will continue our work to improve productivity and efficiency, but we must also turn our attention increasingly to our ability to innovate, achieve technical excellence, and field dominant military capabilities.



Frank Kendall

Attachment:  
As stated

**“Potential adversaries are challenging the U.S lead in conventional military capability in ways not seen since the Cold War. Our technological superiority is based on the effectiveness of our research and development efforts. These efforts span science and technology, component development, early prototyping, full-scale development, and technology insertion into fielded products.”**

## USD(AT&L), BBP 3.0 Implementation Guidance, April 3



# Better Buying Power 3.0

## Achieving Dominant Capabilities through Technical Excellence and Innovation

### Achieve Affordable Programs

- Continue to set and enforce affordability caps

### Achieve Dominant Capabilities While Controlling Lifecycle Costs

- Strengthen and expand “should cost” based cost management
- Anticipate and plan for responsive and emerging threats by building stronger partnerships of acquisition, requirements and intelligence communities
- Institutionalize stronger DoD level Long Range R&D Program Plans
- Strengthen cybersecurity throughout the product lifecycle

### Incentivize Productivity in Industry and Government

- Align profitability more tightly with Department goals
- Employ appropriate contract types, but increase the use of incentive type contracts
- Expand the superior supplier incentive program
- Increase effective use of Performance-Based Logistics
- Remove barriers to commercial technology utilization
- Improve the return on investment in DoD laboratories
- Increase the productivity of corporate IRAD

### Incentivize Innovation in Industry and Government

- Increase the use of prototyping and experimentation
- Emphasize technology insertion and refresh in program planning
- Use Modular Open Systems Architecture to stimulate innovation
- Increase the return on and access to small business research and development
- Provide draft technical requirements to industry early and engage industry in funded concept definition
- Provide clear and objective “best value” definitions to industry

### Eliminate Unproductive Processes and Bureaucracy

- Emphasize acquisition chain of command responsibility, authority and accountability
- Reduce cycle times while ensuring sound investments
- Streamline documentation requirements and staff reviews
- Remove unproductive requirements imposed on industry

### Promote Effective Competition

- Create and maintain competitive environments
- Improve DoD outreach for technology and products from global markets
- Increase small business participation, including more effective use of market research

### Improve Tradecraft in Acquisition of Services

- Strengthen contract management outside the normal acquisition chain — installations, etc.
- Improve requirements definition for services
- Improve the effectiveness and productivity of contracted engineering and technical services

### Improve the Professionalism of the Total Acquisition Workforce

- Establish higher standards for key leadership positions
- Establish stronger professional qualification requirements for all acquisition specialties
- Strengthen organic engineering capabilities
- Ensure development program leadership is technically qualified to manage R&D activities
- Improve our leaders’ ability to understand and mitigate technical risk
- Increase DoD support for STEM education

**Continue Strengthening Our Culture of Cost Consciousness, Professionalism, and Technical Excellence**



# Utilizing Data to Identify Engineering Workforce Trends

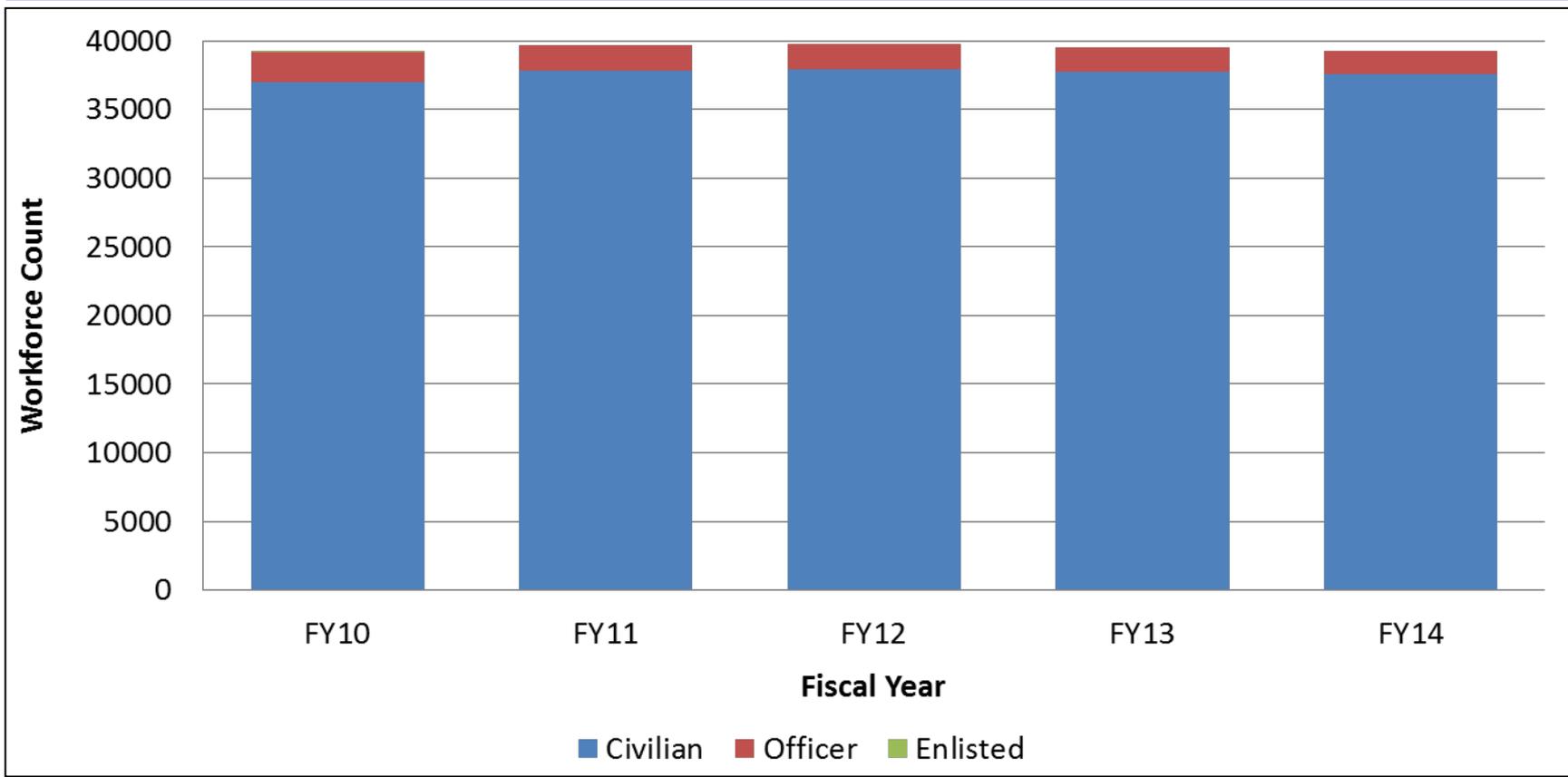
**Objective: Provide Insight into DoD Workforce Challenges in Order to Foster Dialogue with Industry**



# ENG Career Field Personnel on Position FY10-14



**This workforce is mainly comprised of civilian employees, so we anticipate that Industry is seeing similar trends within their engineering workforce**



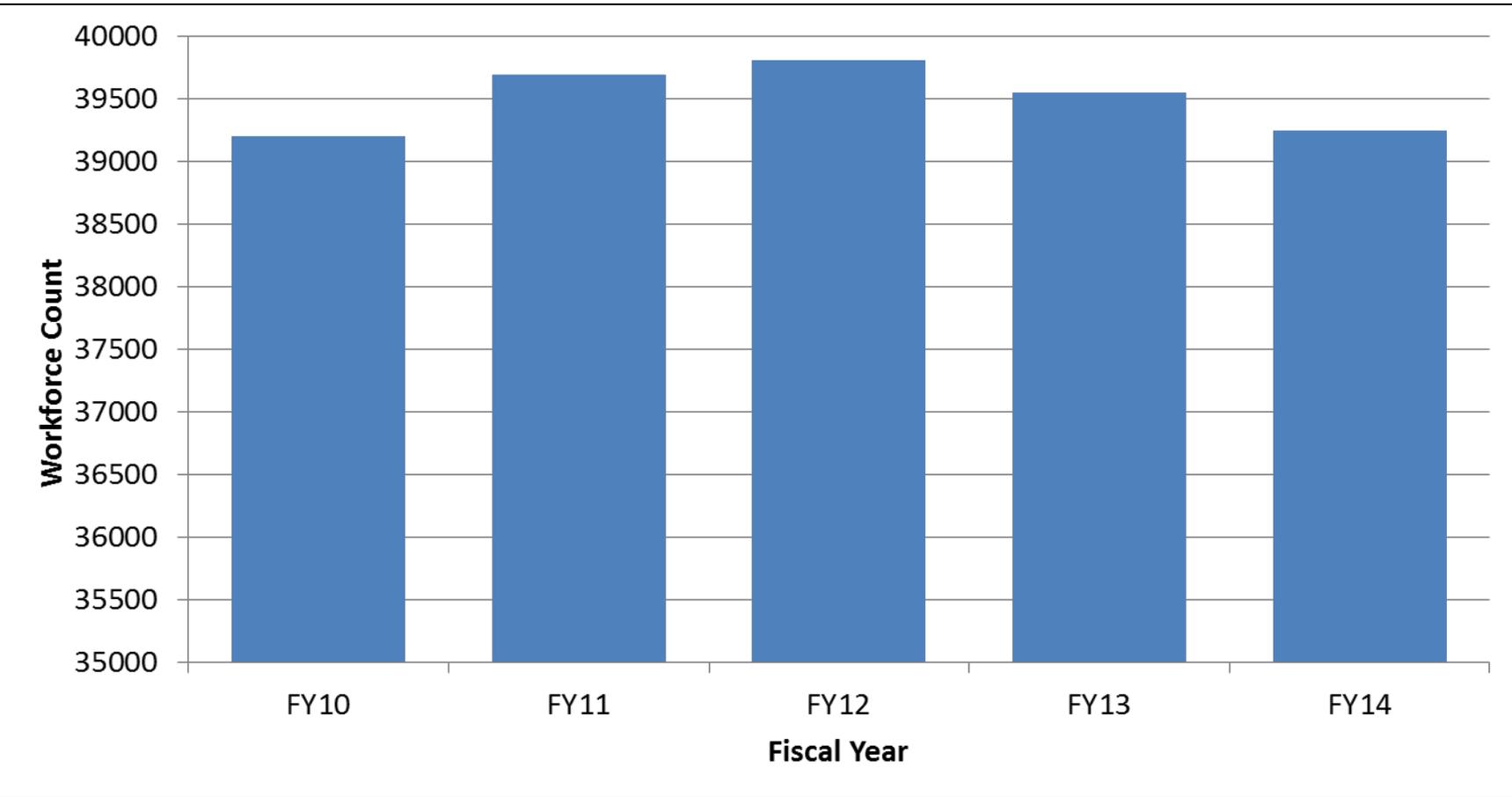
Data Source: USD(AT&L) Defense Acquisition Workforce Data Mart



# ENG Career Field Civilian Workforce FY10-14



## Budget Driven Downsizing Continues



Actual Total Data Source: USD(AT&L) Defense Acquisition Workforce Data Mart  
 Projection Data Source: President's FY16 Budget PB23 Projection – OSD CAPE SNAP Database



# Engineering Workforce Trends



- **Recruiting/maintaining the talent pipeline**
- **Potential untapped resources**
- **Age Demographics – Generational Motivators**



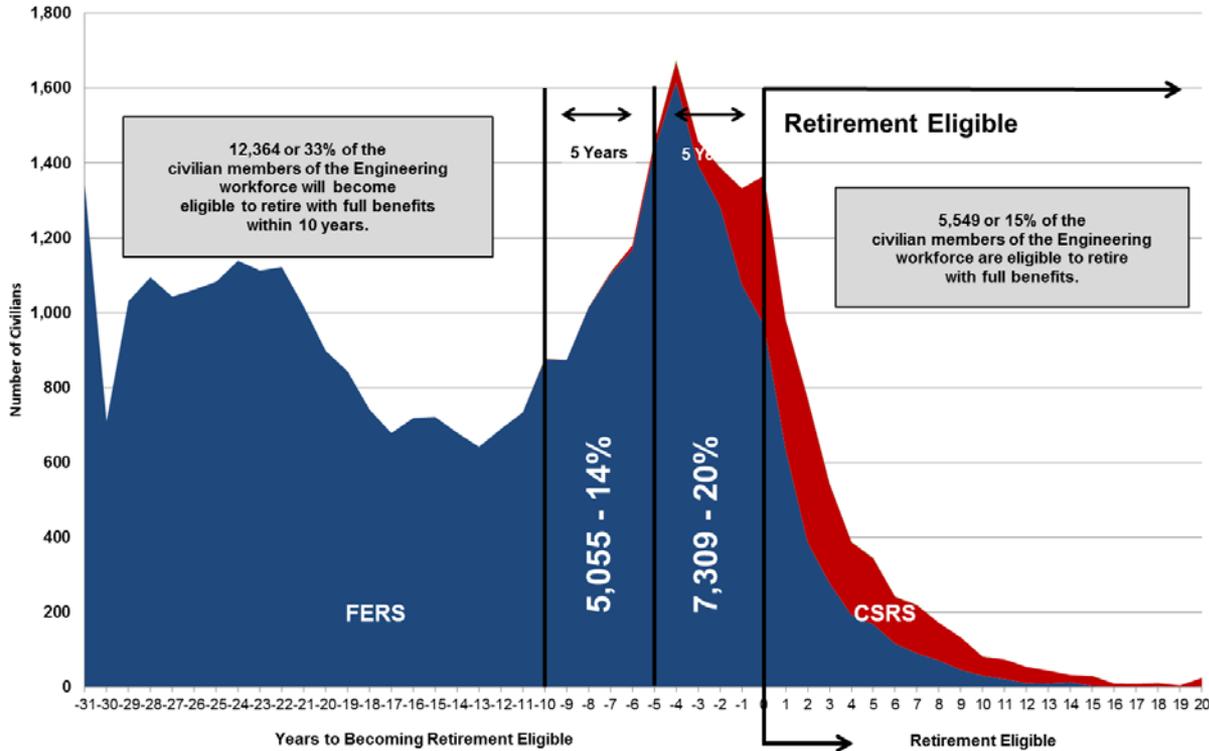
# Engineering Civilian Distribution by Years to Retirement Eligibility



This is still an aging workforce

## Defense Acquisition Workforce - Engineering

Distribution by Years to Retirement Eligibility (Civilians)(FY2014)



Data Source: RAND NDRI Forces and Resources Policy Center

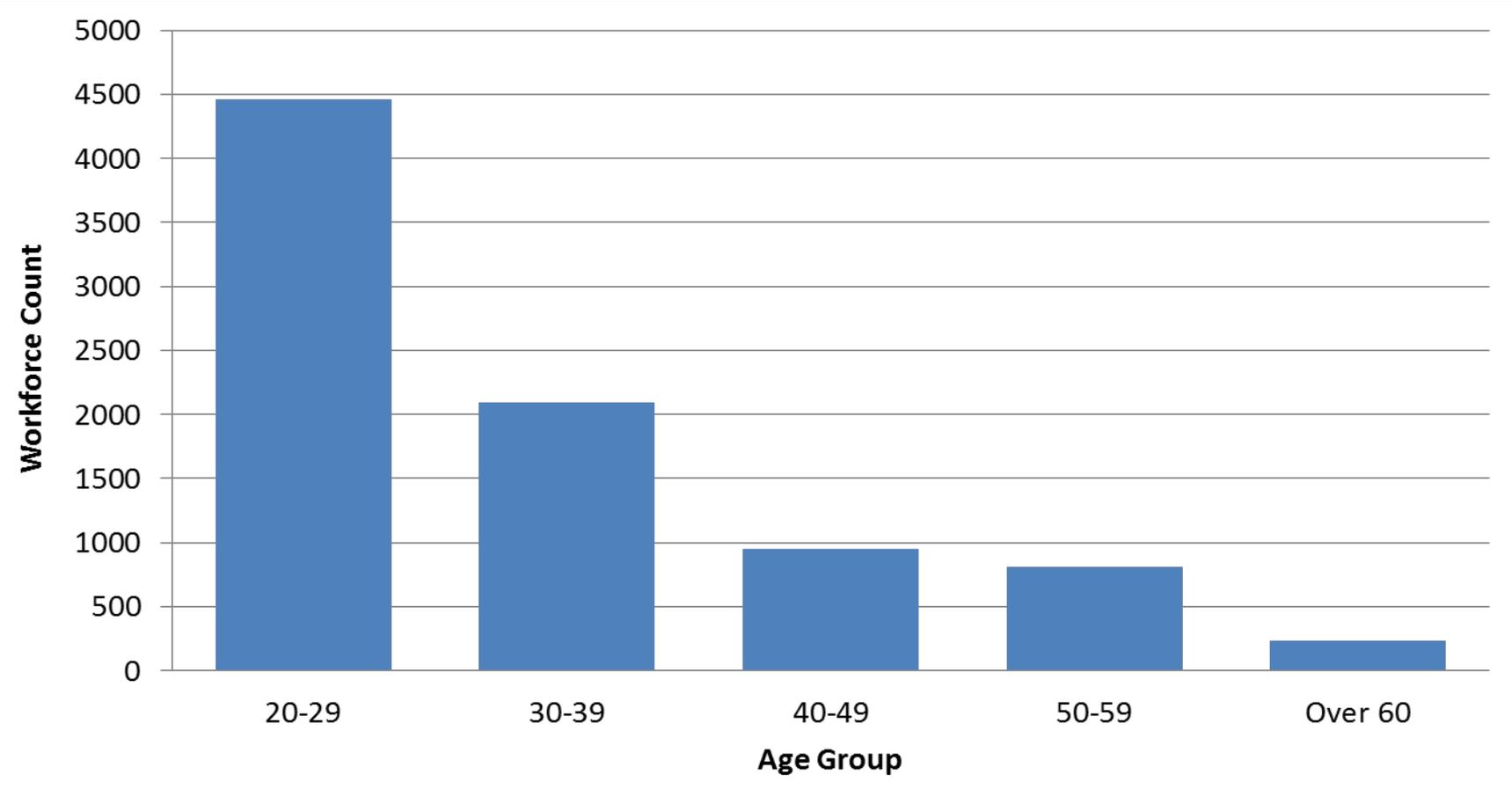
As of the end of FY14 (30 September 2014)



# FY14 ENG Career Field < 5 Years of Service by Age Group



**We are doing a good job hiring mid-level and senior-level engineers**

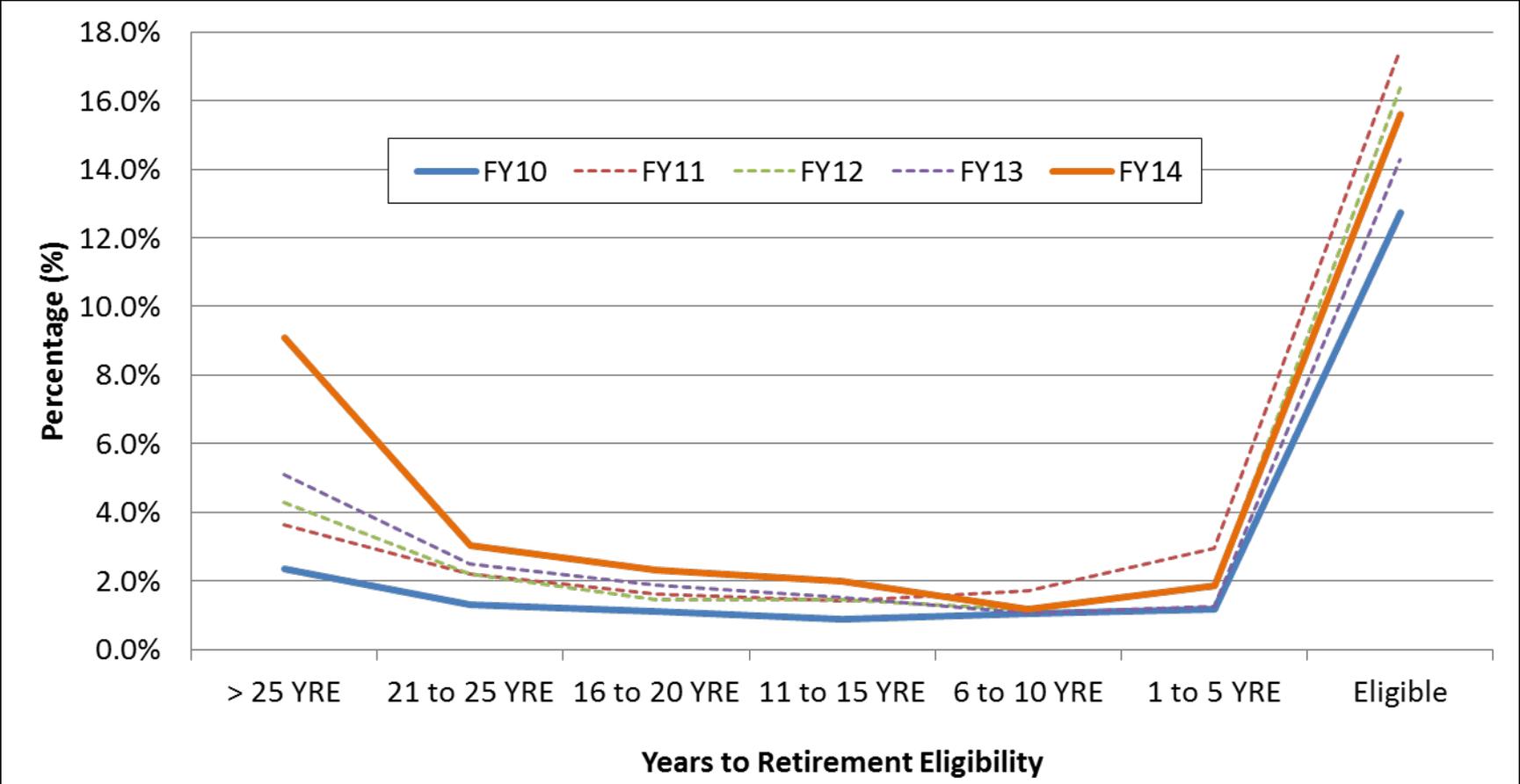


Data Source: USD(AT&L) Defense Acquisition Workforce Data Mart; excludes unknowns



# ENG Career Field Losses by Years to Retirement Eligibility (YRE) FY10-14

**Increased trend in losses for new hires (employees >21 YRE) and retirement eligible employees**



Data Source: RAND NDRI - Engineering Career Field Acquisition Workforce Data - FY09 - FY14



# Recruitment / Retention Trends



- **Large portion of the workforce is still reaching retirement eligibility in the next 5 years**
  - Need to look into and understand how likely this workforce will begin to leave the workforce once they reach eligibility....?
- **Hiring mid-level / senior-level engineers**
  - Need to determine where these employees are coming from (i.e. retired military, other government agencies, industry,...)
- **Problems with retaining the new hires (>21 YRE)**
  - Need to look at additional data (i.e. by Occupational Career Codes, by Location, ...)
  - Need to understand the root cause (i.e. lack of upward mobility, generational motivators, salaries, ...)

**Is Industry dealing with similar trends with its engineering workforce?**



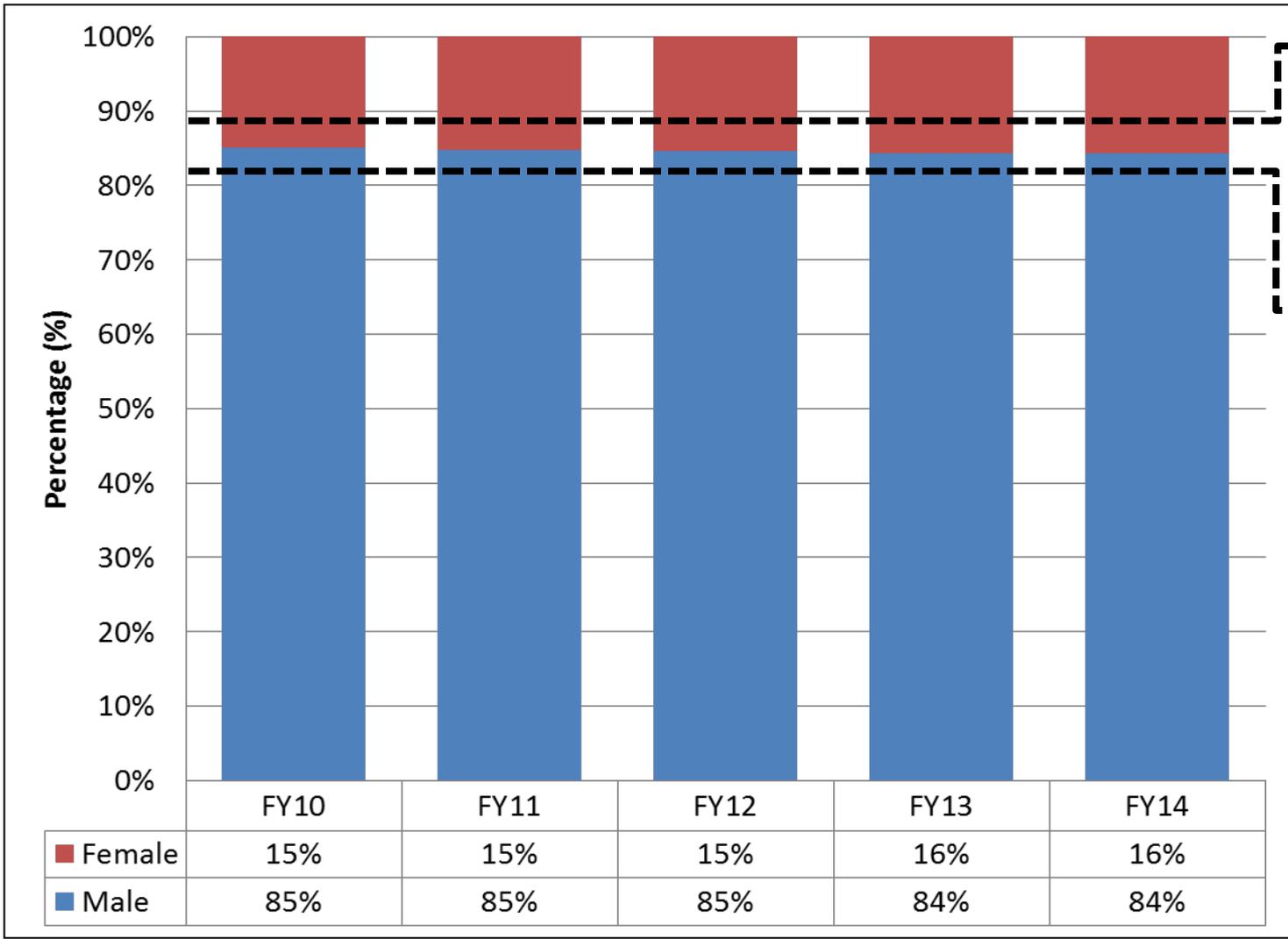
# Engineering Workforce Trends



- ✓ **Recruiting/maintaining the talent pipeline**
  - **Potential untapped resources**
  - **Age Demographics – Generational Motivators**



# ENG Career Field by Gender<sup>1</sup> FY10-14



2010 US Engineering Civilian Workforce<sup>2</sup>  
 - 88% Male  
 - 12% Female

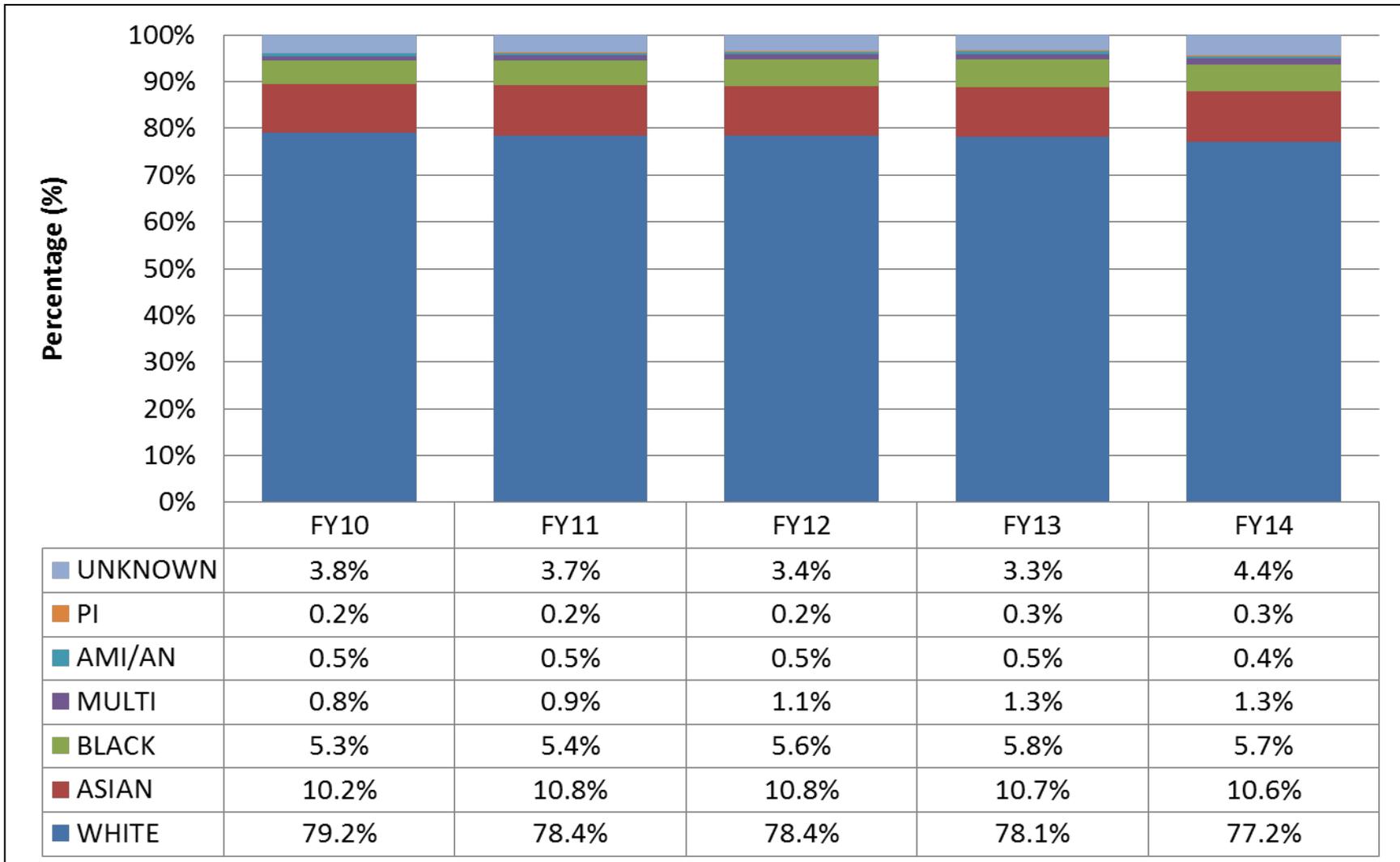
2012 US Engineering Degrees Obtained<sup>3</sup>  
 - 82.5% Male  
 - 17.5% Female

Data Sources:

1. USD(AT&L) Defense Acquisition Workforce Data Mart, 30 September 2014, excludes unknowns
2. U.S. Bureau of Labor and Statistics, <http://www.bls.gov>.
3. Barr, Valerie. "Women in STEM, Women in Computer Science: We're Looking At It Incorrectly." *Communications of the ACM*. 1 Dec. 2014. Web 9 Jan. 2015.



# ENG Career Field by Race FY10-14



Data Source: USD(AT&L) Defense Acquisition Workforce Data Mart



# Untapped Resources to Fill the Talent Pipeline



- **Women and minorities are untapped resources to help build the Nation's requisite engineering capability**
  - **84%** of the ENG Career Field engineers are men
  - Women make up ~**50%** of the country's college-educated workforce, but only make up **17.5%** of US engineering degrees obtained
  - African Americans, Hispanics, American Indians, and Alaska Natives accounted for only ~**10%** of the ENG Career Field

**Need to get our women and under served communities STEM interested, STEM college ready, and STEM educated**



# Engineering Workforce Trends



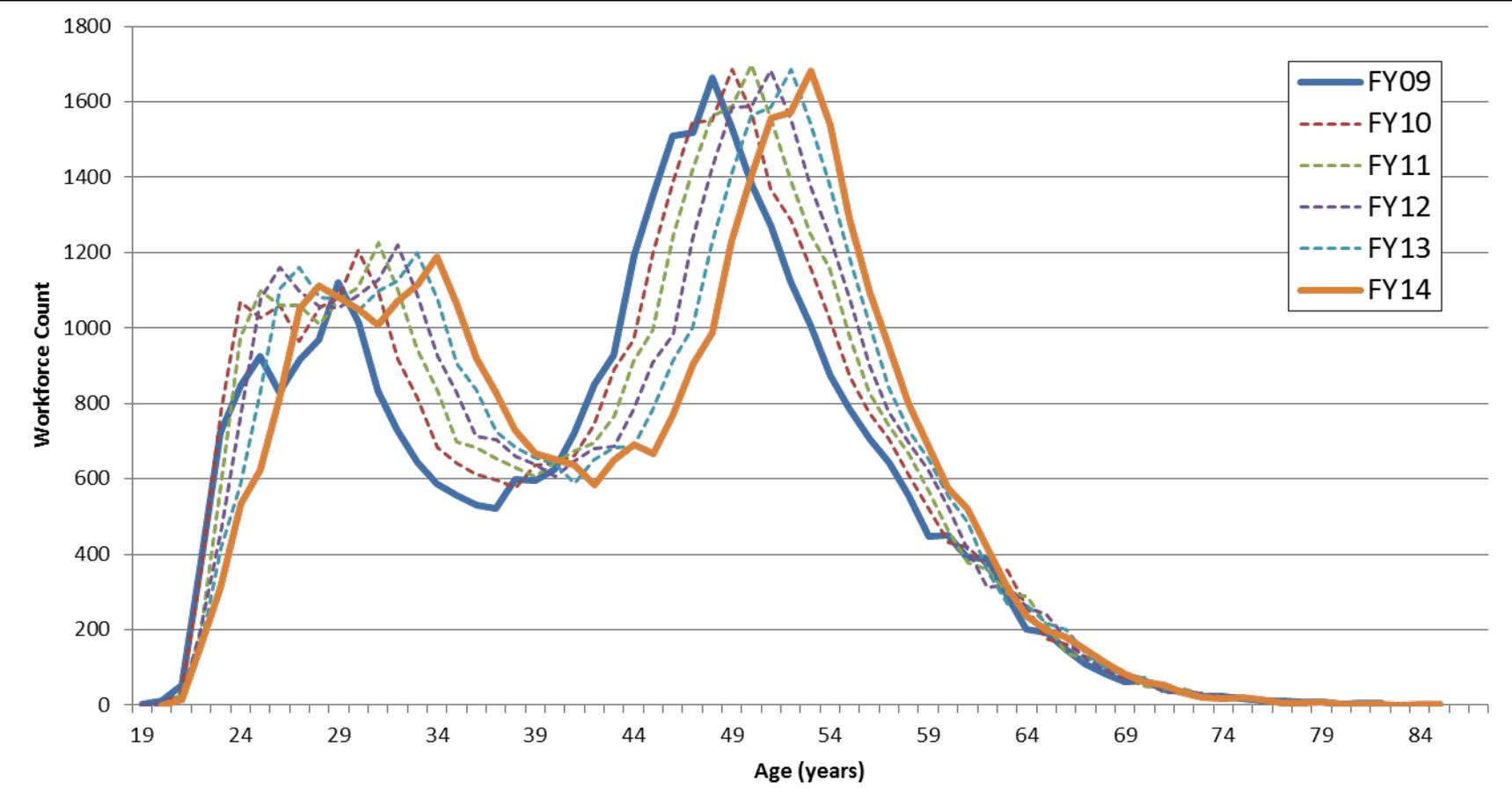
- ✓ **Recruiting/maintaining the talent pipeline**
- ✓ **Potential untapped resources**
  - **Age Demographics – Generational Motivators**



# ENG Career Field Age Demographics FY09-14



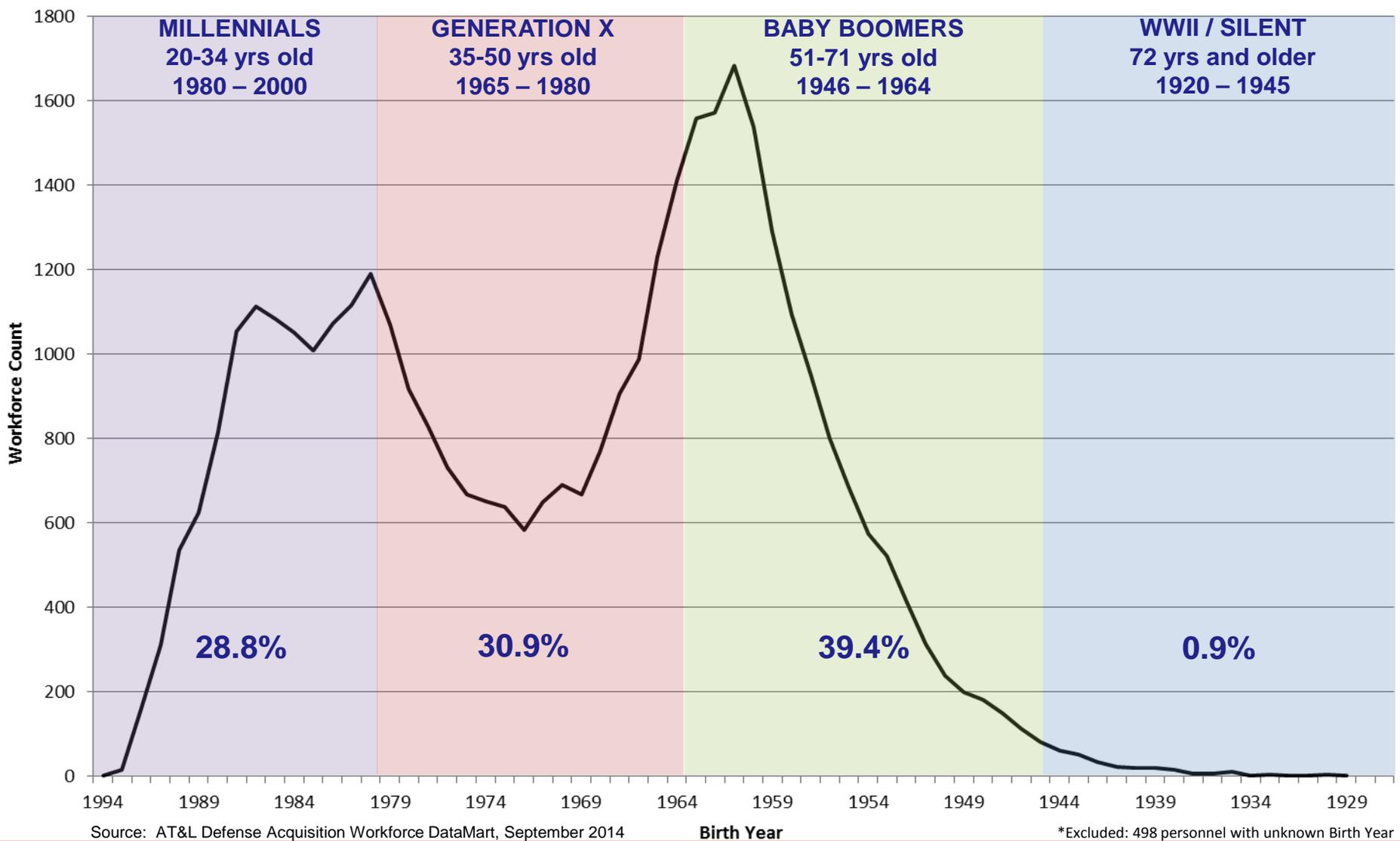
**Diminishing bathtub curve; this workforce is a very diverse age group with different motivators**



Data Source: USD(AT&L) Defense Acquisition Workforce Data Mart; excludes unknowns



# Four Distinct Generations Across the Acquisition Engineering Workforce\*

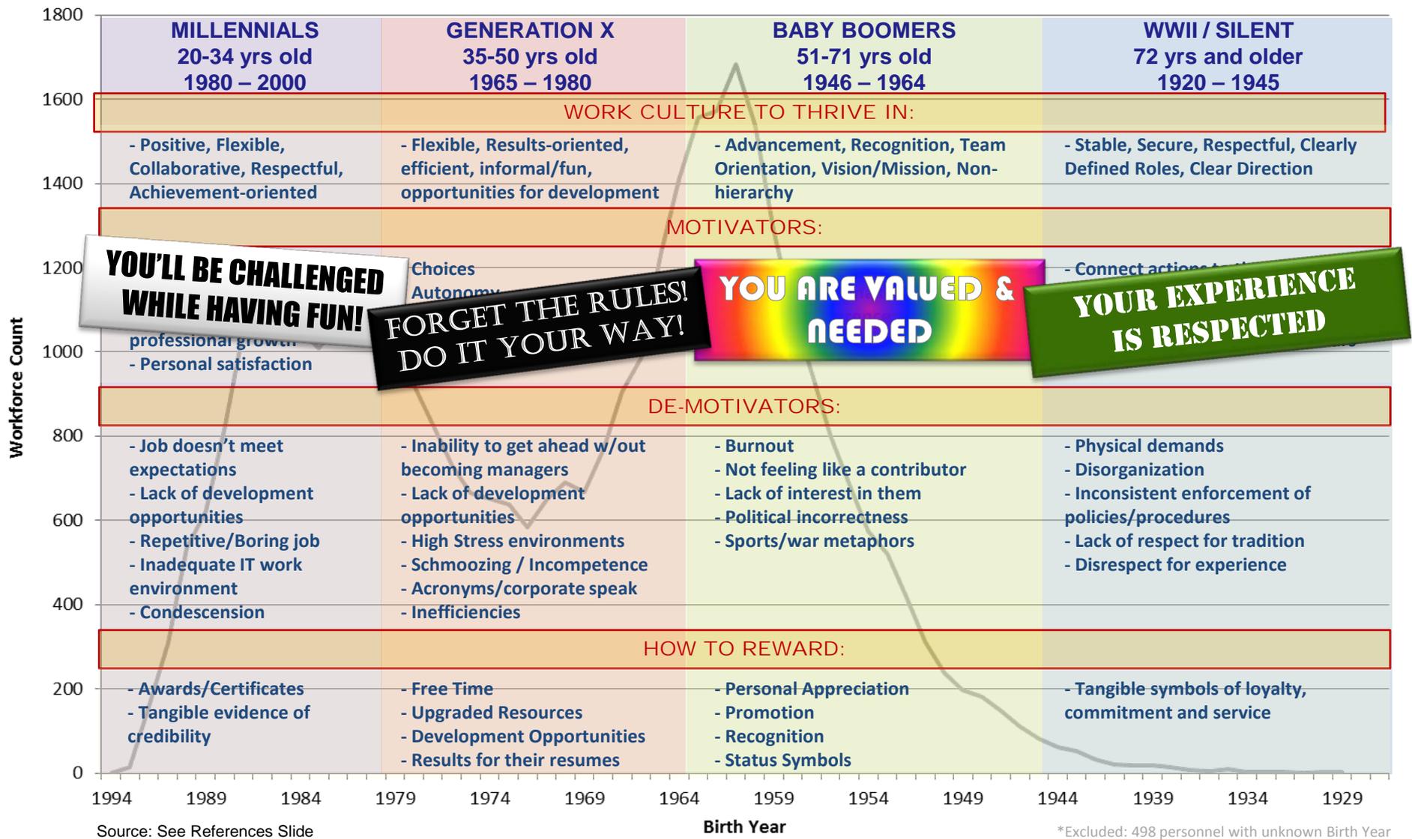


Source: AT&L Defense Acquisition Workforce DataMart, September 2014

\*Excluded: 498 personnel with unknown Birth Year



# Four Distinct Generations Across the Acquisition Engineering Workforce\*





# Factors Important to All Four Generations



- **A University of Minnesota research study revealed that several themes are important to all four generations: Flexibility, Values, and Happiness at Work**
  - All four rated freedom to set own hours as long as the work gets done as the highest importance regarding flexibility
- **The study also showed that all four Generations share the same top three values: Family, Integrity, and Love**
  - Family was #1 for all four
  - Integrity was #2 for Baby Boomers and Silent
  - Love was #2 for Millennials & Gen X
- **All four generations rated “feeling valued” as the top reason for workplace happiness**

**Source:** Research and Training Center on Community Living, University of Minnesota, August 16, 2008



# Initiatives to Address Workforce Trends



# Current Initiatives to Address Workforce Trends



- **Better Buying Power 3.0 Initiatives**

- *Increase DoD support for STEM education:* Develop the DoD engineering talent pipeline
- *Strengthen organic engineering capabilities:* Understand the technical skills required to meet the need

- **Acquiring objective trend data to understand the needs and gaps of the workforce (utilizing both existing and new data sources)**

- DoD FY2016-2021 Strategic Workforce Planning: Environmental Scan
- Engineering and Production, Quality, and Manufacturing Career Field FIPTs



# Future Initiatives



- **Improving the Technical Edge**
  - Understanding the skill set needs of the future
  - Tailoring education and training to fill gaps
  - Motivating the workforce to stay
- **Force of the Future**
  - Hiring authorities
  - Recruitment initiatives
  - Pay flexibility
  - Development/retention



# Conclusions

- **Additional data is needed in order to have informed, actionable, and strategic plans for the engineering workforce**
- **Specifically, we need to dig deeper into the trends/data to gain a better understanding and to potentially determine the root cause**
- **There is an opportunity to compare the ENG workforce trends/data with Industry data and discuss effective recruitment/retentions strategies**



# Systems Engineering: Critical to Defense Acquisition



***Defense Innovation Marketplace***  
<http://www.defenseinnovationmarketplace.mil>

***DASD, Systems Engineering***  
<http://www.acq.osd.mil/se>



# For Additional Information



**Aileen Sedmak**  
**ODASD, Systems Engineering**

**703-695-6364 | [aileen.g.sedmak.civ@mail.mil](mailto:aileen.g.sedmak.civ@mail.mil)**



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