Engineering Policy and Systems Initiatives

Philomena Zimmerman
Deputy Director, Engineering Tools and Environments
OUSD(R&E)

22nd Annual Systems and Mission Engineering Conference
Tampa, FL | 23 October 2019
USD(R&E) Mission

- **Ensure Technological Superiority for the U.S. Military**
  - Set the technical direction for the Department of Defense (DoD)
  - Champion and pursue new capabilities, concepts, and prototyping activities throughout the DoD research and development enterprise

- **Bolster Modernization**
  - Pilot new acquisition pathways and concepts of operation
  - Accelerate capabilities to the Warfighter

“Our mission is to ensure that we, if necessary, reestablish and then maintain our technical advantage.”
- Under Secretary Griffin, April 2018
Modernization Priorities

“We cannot expect success fighting tomorrow’s conflicts with yesterday’s weapons or equipment.”

– National Defense Strategy

- 5G
- Autonomy
- Biotechnology
- Cyber
- Directed Energy
- Fully Networked Command, Control, and Communications
- Hypersonics
- Machine Learning / Artificial Intelligence
- Microelectronics
- Quantum Science
- Space

For each modernization priority, a Portfolio Manager (Assistant Director) is responsible for establishing the DoD-wide, mission-focused strategy and execution plan.
### USD(R&E) “Corporate” at a Glance...

<table>
<thead>
<tr>
<th>Research, Technology &amp; Labs</th>
<th>Strategic Technology Protection &amp; Exploitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provides affordable options for new concepts and capabilities from basic science to advanced tech.</td>
<td>• Assesses and mitigates risk of loss of critical techs</td>
</tr>
<tr>
<td>• Oversees FFRDCs/UARCs and 63 DoD Service labs/centers</td>
<td>• Leads Manufacturing Technology Development and the National Manufacturing Institutes</td>
</tr>
<tr>
<td>• Leads strategic outreach (Intl, SBIR, Cross-Agency)</td>
<td>• Established Resilient-by-Design Methodologies</td>
</tr>
</tbody>
</table>

**USD(R&E) provides leadership from concept to capability to meet the challenges of an uncertain future through advances in science, technology and innovative engineering, informed by developmental test & evaluation**

<table>
<thead>
<tr>
<th>Engineering</th>
<th>Developmental Test, Evaluation &amp; Prototyping</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Assesses feasibility and programmatic risk for major programs throughout the acquisition life cycle</td>
<td>• Advances developmental test standards and policy, assists major programs in developing test plans, and provides oversight for the developmental test community</td>
</tr>
<tr>
<td>• Establishes mission portfolios and joint open system architectures</td>
<td>• Identifies, develops, and demos multidomain concepts and technologies to satisfy DoD, Joint, interagency, and Combatant Command priorities</td>
</tr>
<tr>
<td>Test Resource Management Center</td>
<td>• Works within operational mission threads and obtains Warfighter feedback</td>
</tr>
<tr>
<td>• Provides adequate testing in support of development, acquisition, fielding and sustainment of defense systems; and maintains awareness of test and evaluation (T&amp;E) facilities and resources, within and outside DoD</td>
<td></td>
</tr>
</tbody>
</table>

| Strategic Intelligence and Analysis Cell (SIAC) | Defense Technical Information Center (DTIC) | Defense Microelectronics Activity (DMEA) |

DDRE Advanced Capabilities
High-Level Development Cycle

Legend
- Functions
- DDR&E (AC) Portfolio
- Other Organizations

Assistant Director
Roadmaps

Test Resource Management Center

Development and Production in Industrial Base

Operational Use

Testing

USD Acquisition & Sustainment

Developmental Test, Evaluation & Prototyping

Prototyping & Demonstration

Engineering Policy & Systems

Mission Integration

New Technology Awareness and Development

Analysis & Architectures

USD Acquisition & Sustainment

- Hypersonics
- Fully Networked C3
- Space
- Autonomy
Reports to the Deputy Director of Engineering
   – Along with Mission Integration

Responsibilities include:
   – Design and Development – Expert Engineering Support
   – Engineering Tools and Environments
   – Policy and Guidance – Engineering, Test, and Evaluation
   – Acquisition Workforce – ENG, T&E, PQM
   – Systems Engineering Research Center
   – Common Mission and System Architectures*
   – Software*

*New Responsibility
Design and Development

- Technical Domain
  - Matrixed Engineering and Software Support

- Specialty Engineering
  - Advance Systems Engineering Practices and Tools
  - Advance Workforce Competencies
  - Define and Optimize Policy and Guidance

- Software Engineering
  - Software Engineering Program Support
  - Software Metrics and Benchmarking
  - Software Engineering Modernization and Transformation
Digital Engineering
DoD initiative to transform the way the DoD designs, develops, delivers, operates, and sustains systems.
Definition – An integrated digital approach that uses authoritative sources of system data and models as a continuum across disciplines to support lifecycle activities from concept through disposal.

Modular Open Systems Approach
DoD initiative to design and develop systems that implements interface standards with severable modules.
Eases transition of emerging technologies into warfighting systems at the speed of relevance.
Enables interoperability and competition.

**DDRE(AC) Policy Roadmap**

**PHASE I: Near Term Policy Goals:**
- Establish Authority of USD(R&E) in Acquisition
- Codify statutory changes, e.g. ITRA, DT&E Sufficiency Assessments
- Clarify regulatory changes

**PHASE II: Strategic Policy Goals:**
- Advancing the state of practice in Engineering, DT&E …
- Improve communication with industry
- Improve critical thinking
- Clarify regulatory changes

**Outcomes:**
- Publish policies that are current and consistent with statute, regulations, and techniques
- Outline responsibilities and key aspects of technical program
- Refresh processes and techniques; increase data visibility
- 8 Major Updates

**Outcomes:**
- Improve Innovation and efficiency
- Ensure Production Readiness
- Accelerate Technology Transition to the Warfighter
- Shape a policy for a technically competent workforce ready to tackle technology insertion and new capabilities
- Shape a policy to improve engineering and DT&E with updated tools and techniques
- Drive access to design artifacts

**Enhanced Policy Improves Engineering and DT&E Competencies and Effectiveness**

DDRE(AC) Workforce Initiatives

Rotational Training Assignment
Broadening perspectives of mid-career professionals in the T&E acquisition workforce on policy and management involving development and acquisition of DoD weapon systems programs.

Pilot - Advanced Technical Degree Guidebook
Validating and incorporating improvements into the next iteration of the guidebook, ensuring its relevance and usefulness across the civilian engineering acquisition workforce.

Preparing the Acquisition Workforce for Digital Engineering
Documenting the competencies, skills, tools, and processes that will be needed to embed Digital Engineering practices in DoD.

Competency Assessment:
Production, Quality, & Manufacturing
Developing standardized, OPM-compliant competency models across the acquisition workforce that accurately reflect the primary occupational competencies needed to be a successful member of each respective career field.

Competency Study:
Agile, DevOps, Software Development
Multi-year project developing a guidebook identifying modern software competencies, training, education, and experience opportunities, facilitating the DoD’s transition to a more agile software acquisition workforce.

Competency Study – Cyber Resilience
Multi-year project, examining DoD’s Cybersecurity and Engineering policies and standards for engineering Cyber Resilient Weapon Systems (CRWS) to create a CRWS framework, define required competencies, identify training gaps, and make gap closing recommendations.

Competency Study:
Human Systems Integration
Multi-year project, addressing congressionally cited weaknesses in the acquisition workforce’s application of human systems integration (HSI) factors and culminate in the definition of HSI competencies, acquisition workforce gap assessment, and gap closing strategies.

FY19 Focus on Defining Competencies for Emerging Critical Knowledge Areas
**SERC Research Areas and Missions**

### Mission Engineering

- **Improve Speed to the Fight**
- **Increase SE Reach and Rigor**
- **Assure safety and security**
- **Be at the forefront of integrating Emerging Tech**
- **Lead Enterprise Transformation**
- **Meet the challenge of Complexity**
- **Educate the future workforce**

#### VEL City

**TRUSTED SYSTEMS**

- **VELOCITY**
  - Developing and sustaining capabilities that support emergent and evolving mission objectives (deter and defeat emergent and evolving adversarial threats and exploit opportunities, affordably and with increased efficiency)

#### S
c

**ENTERPRISES AND SYSTEMS OF SYSTEMS**

- **SECURITY**
  - Designing and sustaining the demonstrable ability to safeguard critical technologies and mission capabilities in the face of dynamic (cyber) adversaries

#### A

**SYSTEMS ENGINEERING AND MANAGEMENT TRANSFORMATION**

- **AI & AUTONOMY**
  - Developing and supporting system engineering MPTs to understand, exploit and accelerate the use of AI and autonomy in critical capabilities

#### A

**HUMAN CAPITAL DEVELOPMENT**

### Digital Engineering
SERC Major Research Efforts

- Digital Engineering Measures
  OUSD(R&E)
- Approaches to Achieve Benefits of Modularity in Defense Acquisition
  OUSD(R&E)
- Preparing the Acquisition Workforce for Digital Engineering: Developing a Digital Engineering Competency Framework
  OUSD(R&E)
- Transforming Systems Engineering Through Model-Centric Engineering – Phase 6
  NAVAIR
- Model Curation Innovation and Implementation
  OUSD(R&E)
- Safety Assessment Methods for Supercritical Water Oxidation
  OUSD(A&S)
- Systems Engineering Capstone Marketplace
  OUSD(R&E) & SOCOM
- Meshing Capability and Threat-based S&T Resources – Phase 2
  US Army – CCDC AC
- Global Positioning Systems – Mission Engineering and Integration of Emerging Technologies
  USAF SMC
- Security Engineering 2019
  OUSD(R&E)
Acronyms and Abbreviations

- AI – Artificial Intelligence
- CCMD – Combatant Command
- CRWS – Cyber-Resilient Weapon System
- DDRE(AC) – Director of Defense Research and Engineering for Advanced Capabilities
- DMEA – Defense Microelectronics Activity
- DTIC – Defense Technical Information Center
- DoD – Department of Defense
- DT&E – Developmental Test and Evaluation
- ENG – Engineering
- FFRDC – Federally Funded Research and Development Center
- FNC3 – Fully Networked Command, Control, and Communications Federally Funded Research and Development Center
Acronyms and Abbreviations

- HSI – Human Systems Integration
- ITRA – Independent Technical Risk Assessment
- MPT – Methods, Processes, and Tools
- OPM – Office of Personnel Management
- OUSD(R&E) – Office of the Under Secretary of Defense for Research and Engineering
- PQM – Production, Quality, and Manufacturing
- SE – Systems Engineering
- SBIR – Small Business Innovation Research
- SERC – Systems Engineering Research Center
- SIAC – Strategic Intelligence and Analysis Cell
- UARC – University-Affiliated Research Center
Questions?
Back up
Currently, USSOCOM relies on the Services to provide Modeling and Simulation (M&S) training systems to enable Special Operations Forces (SOF) training and mission rehearsal. However, current system configurations lack the ability to rapidly connect these Service-provided simulators, resulting in months of effort to reconfigure M&S systems or to build "translator" bridges that enable them to work together and share data needed to support a common operating picture. Furthermore, the current Department of Defense (DoD) process of producing and accrediting the needed M&S environment is unacceptably long—months, instead of hours or days.
**Desired End-State**

- **Army**
  - Shared Geospatial database
  - Use a common geospatial database as a correlated source of authoritative data

- **Air Force**
  - Compiled/Published run-time database

- **SOF & JS/J7**
  - National sources
  - Commercial sources

- **Navy & Marines**
  - Tactical sources
  - National sources

Reduce total labor
- Increase commonality and improve interoperability
Modular Open Systems Approach

MOSA Community of Practice Established

PM Contract Guidebook
IP Policy and Strategy

MOSA Reference Frameworks

2018 NDS: Modernization, Modular Upgrades, Speed of Relevance
2017 NDAA: Sec 805 MOSA Requirement for MDAPs

Statute, Regulation, Guidance

MOSA Ecosystem Instantiated

2019 Tri-Service Implementation: MOSWG Service’s and industry members formed 3 tiger teams to formalize access and management of MOSA-enabling standardization and specifications, MOSA implementation guidance, and acquisition requirements

7 Jan 2019 Service Secretaries direction to implement the use of MOSA and standards across the Joint Force

DAU CLE019 Online Training

2019 NDAA 870 Report on Tech Data

## Collaborators/Partnerships

- Armed Services
- DoD Components
- Interagency
- Industry/OEMs/Industrial Orgs
- Academic

## Strategy & Service Plans

Outline DoD’s five strategic goals for Digital Engineering initiatives

- Service Implementation Plans

## Next Steps

- Regular monitoring of Service Implementation Plans by USD(R&E)/AC leadership
- Service, Industry, Academic, and Standards organization collaborations to further the Digital Engineering implementations
- Address challenges
- INCOSE/NDIA Digital Engineering Information Exchange Working Group to advance concepts
- Research areas initiating in curation and credibility
- Release Digital Engineering Policy
- Instantiate a DoD Digital Engineering Ecosystem & Body of Knowledge
The Extended OUSD(R&E) Enterprise

- **Defense Advanced Research Projects Agency**: Makes pivotal investments in breakthrough technologies for national security
- **Defense Innovation Unit**: Identifies, evaluates, and purchases commercial innovation to solve national defense problems
- **Strategic Capabilities Office**: Develops disruptive and asymmetric uses of existing systems to regain the element of surprise
- **Strategic Intelligence Analysis Cell**: Provides an operational, technical, and threat-informed analytic foundation for DoD investment decisions to restore technical overmatch to the Joint Force
- **Missile Defense Agency**: Develops and deploys a layered Ballistic Missile Defense System to defend the United States, its deployed forces, allies, and friends from ballistic missile attacks of all ranges and in all phases of flight
Engineering Policy and Systems

- Reports to the Deputy Director of Engineering
  - along with Mission Integration

- Responsibilities Include:
  - Expert Engineering Support
  - Common Mission and System Architectures*
  - Engineering Tools and Environments
  - Policy and Guidance – Engineering, Test & Evaluation
  - Acquisition Workforce – ENG, T&E, PQM
  - Systems Engineering Research Center
  - Modeling and Simulation Policy, Standards, and Collaboration

*New Responsibility
Defense Modeling and Simulation Coordination Office

Strategic Vision:
Empower DoD with modeling and simulation capabilities that effectively and efficiently support the full spectrum of the Department’s activities and operations.

- Develop and update Defense-wide M&S policies and guidance to enable interoperability and reuse in support of DoD operations and activities.

- Promote cooperation and collaboration among DoD Components, industry, and academia to find solutions for removing barriers to common M&S problems.

- Develop and maintain standards and a standardization process that promote the sharing of tools, data, and information across the Department.

- Provide technical expertise in M&S to the Department. Identify and assess technology from DoD Components, Federal Agencies, FFRDCs, Industry, and Academia for application Defense-wide.