Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Office of the Secretary Of Defense	Date: May 2017
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	0.000	17.904	17.659	25.395	-	25.395	19.884	19.852	14.946	15.260	Continuing	Continuing
P401: *DoD Modeling and Simulation Management Office*	0.000	3.296	3.158	10.519	-	10.519	4.927	5.102	5.186	5.200	Continuing	Continuing
P402: *Systems Engineering Research Center*	0.000	4.869	4.760	4.930	-	4.930	4.979	4.875	4.881	5.030	Continuing	Continuing
P403: *Engineered Resilient Systems*	0.000	9.739	9.741	9.946	-	9.946	9.978	9.875	4.879	5.030	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses Defense Research and Engineering priorities to advance engineering state of the practice, and address complex defense systems challenges through development of engineering capabilities to improve acquisition quality. Engineering science and technology, including modeling and simulation (M&S), systems engineering (SE) research, and engineering capabilities for resilience, supports the cost-effective acquisition of complex systems in support of the full range and scope of Department of Defense (DoD) missions and operations.

M&S is a key enabler of DoD capabilities; underpins innovative solutions meeting real-world national security challenges; acts as a force multiplier; saves resources; and saves lives. The DoD Modeling and Simulation Management Office (MSMO), designated by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) to be the focal point and advocate for DoD M&S, enhances the DoD M&S Enterprise by (1) enabling cooperation and collaboration in identifying, developing and sustaining modeling and simulation solutions; and (2) promoting technology solutions, including common M&S architectures, standards, and services that improve interoperability, reuse, and cost effectiveness of DoD M&S.

SERC is a University Affiliated Research Center (UARC) established in 2008 as a strategic resource to further systems research and increase its impact on the Department's ability to meet its mission. Greatly improved SE methods, processes and tools are essential to the DoD strategy to field systems that are agile, affordably sustainable, flexible, and ready for a full range of contingencies in the face of declining budgets and a shrinking workforce. The SERC consists of a network of 23 research universities from across the U.S. that work collaboratively to bring the best talent in the nation to bear on DoD's systems engineering research problems.

Engineered Resilient Systems (ERS) addresses the need for achieving more affordable and mission-resilient warfighting systems designed within a shorter time frame by conducting research and development and new concepts for implementing an integrated suite of modern computational engineering tools, modeling capabilities, and tradespace assessment and visualization tools within an architecture aligned with acquisition and operational business processes. These integrated tools will operate within a framework that supports data-driven decision-making in an innovative environment that enables advanced knowledge management and multi-community collaboration, including data retention and lessons learned.

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Office of the Secretary Of Defense	Date: May 2017
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	18.341	17.659	19.413	-	19.413
Current President's Budget	17.904	17.659	25.395	-	25.395
Total Adjustments	-0.437	0.000	5.982	-	5.982
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.437	-			
• Other	-	-	5.982	-	5.982

Change Summary Explanation

The FY 2017 baseline adjustment of $9.035M was added for Engineering Resilient Systems to focus on mission-relevant trade-space analysis and cost reduction pre-milestone B.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) P401 / *DoD Modeling and Simulation Management Office*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
P401: *DoD Modeling and Simulation Management Office*	0.000	3.296	3.158	10.519	-	10.519	4.927	5.102	5.186	5.200	Continuing	Continuing

A. Mission Description and Budget Item Justification

Modeling and Simulation (M&S) supports the full range and scope of Department of Defense (DoD) missions and operations. M&S is a key enabler of DoD capabilities; underpins innovative solutions meeting defense and national security challenges, and saves resources. The Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), under the authority of DoD Directive 5134.01, designated the DoD Modeling and Simulation Management Office (MSMO) to be the focal point and advocate for Defense M&S to enhance the Defense M&S Enterprise by (1) enabling cooperation and collaboration in identifying, developing and sustaining modeling and simulation solutions; and (2) promoting technology solutions, including common M&S architectures, standards, and services that improve interoperability, reuse, and cost effectiveness of DoD M&S. MSMO executes its efforts in accordance with the USD(AT&L)-promulgated DoD Directive 5000.59, “Management of Modeling and Simulation” and DoD Instruction 5000.70, “Management of DoD Modeling and Simulation (M&S) Activities;” and other DoD Issuances, including DoD 4120.24-M, “DoD Standardization Program (DSP) Policies and Procedures” and DoD Instruction 3200.14, “Principles and Operational Parameters of the DoD Scientific and Technical Information Program.”

MSMO is responsible for:
• Planning, coordinating, and managing funds to support enterprise-level M&S activities that guide the Defense M&S Community to achieve the DoD Strategic Vision for M&S.
• Bringing together M&S stakeholders to advise and assist on finding solutions for removing the barriers to interoperability, reuse, commonality, efficiency, and effectiveness.
• Developing, coordinating, and advocating for policy/guidance, technology, standards, best practices, and strategic planning processes that promote interoperability and reuse across the Department.

MSMO also serves as DoD’s:
• Focal point and advocate for coordinating M&S information exchanges and interactions within DoD, with other U.S. Government departments and agencies, international allies, industry, and academia to promote sharing of information and practices, synergy of efforts, and M&S as a key enabler of all organizations’ missions.
• Lead Standardization Activity (LSA) for managing M&S standards and methodologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: DoD Modeling and Simulation Management Office (MSMO)	3.296	3.158	10.519
Description: MSMO, as the USD(AT&L)-designated focal point for Defense modeling and simulation (M&S), is responsible for maintaining and enhancing policies, standards, technology, and collaboration to ensure the efficiency and effectiveness of the M&S that supports the full range and scope of Defense missions and operations.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P401 / *DoD Modeling and Simulation Management Office*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018

MSMO: (1) conducts management and technical support for the Department's current and long-term M&S needs; (2) responds to opportunities to leverage relevant DoD Information Technology (IT) enterprise capabilities and DoD-, Industry-, and Academia-developed M&S technologies; and (3) advocates an enterprise approach for the future of DoD M&S, maintaining strong engagement and ties with Defense and external community stakeholders.

FY 2016 Accomplishments:

Policy and Guidance:

• Supported the development of a plan for promulgating/updating DoD policy for integrated red and blue force modeling, simulation, and analysis (MS&A) as part of the Department's Better Buying Power 3.0 initiative, and advocated for the use of the DMSCO-developed Integrated Threat Analysis Simulation Environment (ITASE) as an enabling tool to support MS&A.

Standards:

• Chaired the M&S Standardization Activities Advisory Group resulting in DoD adoption of 12 voluntary, consensus standards developed by non-government standards bodies.

• Developed an initial version of the Defense M&S Reference Architecture to document best practices, principles, and standards to guide M&S use of emerging technologies and enterprise IT services.

Technology:

• Developed, enhanced, and advocated the M&S enterprise suite of tools.

• Chaired the Cyber M&S Technical Working Group (CyMSTWG), and facilitated the CyMSTWG's subgroups working cyber range and cyber threat issues.

Collaboration:

• Represented U.S. interests in International M&S activities:

– Chaired TTCP Joint Systems & Analysis Group (JSA), Technical Panel (TP) 2 on M&S, as well as led or participated in subordinate TP 2-sponsored action areas.

– Served as the US Principal Voting Member for NATO M&S Group (NMSG) and participated in NMSG-sponsored task groups.

– Initiated development of a DoD-level Information Exchange Agreement (IEA) with the United Kingdom to provide a broader, more flexible opportunity for the Services and DoD organizations to exchange information on M&S activities, as desired.

FY 2017 Plans:

Policy and Guidance:

• Initiate and publish updates to DoD Instruction 5000.61 (DoD M&S Verification, Validation, and Accreditation).

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P401 / *DoD Modeling and Simulation Management Office*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
• Initiate and complete a Department-wide assessment of simulation capabilities to support resource decisions in DoD M&S development and use. Standards: • Serve as the Lead Standardization Activity for M&S Standards and Methodologies, and/or lead and participate in Defense Standardization Program Office and Joint Enterprise Standards Committee activities. • Refine the Defense M&S Reference Architecture to maintain consistency with changes to the overall DoD IT policies and infrastructure. Technology: • Develop, enhance, and advocate the M&S enterprise suite of tools. • Chair M&S Community of Interest, Cyber M&S Technical Working Group, and M&S Architecture Working Group. • Perform technology watch/horizon scanning related to M&S emerging capabilities. Collaboration: • Represent the U.S. interests in International M&S activities: – Serve as the Chair of the NATO M&S Group (NMSG) and participate in NMSG task groups. – Participate in activities of the Simulation Interoperability Standards Organization. • Collaborate with interagency organizations, as required.			
FY 2018 Plans: Government-Owned Integrated M&S: • Leveraging the FY2017 assessment, develop and prototype use cases illuminating acquisition decision issues using Blue and Red models in an appropriate simulation environment in a joint concept. Policy and Guidance: • Initiate and publish a DoD M&S Strategy to guide the Department's planning for and investing in M&S capabilities and tools. • Assist Services and Defense Agencies in development of their Verification, Validation, and Accreditation (VV&A) plans. Standards: • Serve as the Lead Standardization Activity for M&S Standards and Methodologies, and/or lead and participate in Defense Standardization Program Office and Joint Enterprise Standards Committee activities and International standards activities such as NATO Standardization Agreements for M&S.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P401 / *DoD Modeling and Simulation Management Office*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
• Refine the Defense M&S Reference Architecture to maintain consistency with changes to the overall DoD IT policies and infrastructure. Technology: • Develop, enhance, and advocate the M&S enterprise suite of tools. • Chair M&S Community of Interest, Cyber M&S Technical Working Group, and M&S Architecture Working Group. • Perform technology watch/horizon scanning related to M&S emerging capabilities. Collaboration: • Represent U.S. interests in International M&S activities: – Serve as the Chair of the NATO M&S Group (NMSG) and participate in NMSG task groups. • Collaborate with interagency organizations, as required.			
Accomplishments/Planned Programs Subtotals	3.296	3.158	10.519

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance in this program is monitored in the following ways:

- Number of instances where M&S standards, technical best practices, or tools have been adopted or employed.
- Number of M&S resources (tools, data, and services) made visible or updated in the DoD M&S Enterprise Catalog for reuse and the completeness of each record according to DoD discovery metadata standards.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) P402 / *Systems Engineering Research Center*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
P402: *Systems Engineering Research Center*	0.000	4.869	4.760	4.930	-	4.930	4.979	4.875	4.881	5.030	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Systems Engineering Research Center (SERC) is a University Affiliated Research Center (UARC) established in 2008 as a strategic resource to further systems research and increases its impact on the Department's ability to meet its mission. Greatly improved SE is essential to DoD's strategy to field systems that are agile, affordably sustainable, flexible, and ready for a full range of contingencies in the face of declining budgets and a shrinking workforce.

The SERC's network of universities is led by the Stevens Institute of Technology, and includes the Air Force Institute of Technology, Auburn University, Carnegie Mellon University, Georgetown University, Georgia Institute of Technology, Massachusetts Institute of Technology, Missouri University of Science and Technology, Naval Postgraduate School, North Carolina Agricultural and Technical State University, Pennsylvania State University, Purdue University, Southern Methodist University, Texas A&M University, Texas Tech University, University of Alabama, University of California, University of Maryland, University of Massachusetts, University of Southern California, University of Virginia, and Wayne State University. These Universities work collaboratively to bring the best talent in the nation to bear on DoD's systems engineering research problems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Systems Engineering Research Center	4.869	4.760	4.930
Description: The SERC is a DoD UARC which conducts University-based research that directly supports DoD's Strategic Plan through development of new systems engineering methods, processes and tools. ***FY 2016 Accomplishments:*** Enhanced engineering methods, processes and tools (MPTs) to improve in the following areas: • Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions; – Affordability research integrated into courses at several universities. – Developed tool to help organizations evaluate the benefits of employing agile systems engineering methods. • Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of systems to provide an overwhelming competitive advantage over our adversaries; – Congressional commendations to Secretary of the Army for acting on technical report for a Systems Oriented Study of Army Lethality.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P402 / *Systems Engineering Research Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
• Trusted Systems: secure defense systems from cyber and other threats through systemic security approaches that complement incomplete current perimeter/network defense methods; and – Transitioned security engineering methods to U.S. Army Armaments Research, Development and Engineering Center for initial use on Advanced Lethality and Accuracy System for Medium Caliber. • Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base. – Best paper award for systems engineering capstone research. 19 capstone design projects sponsored by U.S. Special Operations Command. ***FY 2017 Plans:*** Continue to enhance engineering methods, processes and tools (MPTs) to improve in the following areas: • Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions; – Publish technical report on emerging methods to evaluate system responses under complex uncertainties • Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of systems to provide an overwhelming competitive advantage over our adversaries; – Publish technical report on foundational methods for development of robust architectures to enable end-to-end mission engineering; • Trusted Systems: secure defense systems from cyber and other threats through systemic security and assurance approaches that complement incomplete current perimeter/network defense methods; –Transition cyber-resilient engineering methods to U.S. Army Engineering Center. • Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base. – Publish v1.0 of Atlas, a theory that identifies the factors that make systems engineers effective along with methods to improve their proficiency, such as education, mentoring and rotational assignments. ***FY 2018 Plans:*** Continue to enhance engineering methods, processes and tools (MPTs) to improve in the following areas: • Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions;			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P402 / *Systems Engineering Research Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
– Apply and validate tools to understand tradeoffs in affordability and other system qualities. • Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of systems to provide an overwhelming competitive advantage over our adversaries; – Complete pilot application of System of Systems Analytic Workbench with Naval Systems Warfare Center. • Trusted Systems: secure defense systems from cyber and other threats through systemic security and assurance approaches that complement incomplete current perimeter/network defense methods; – Evaluate results of pilot application of formal methods for resilient systems with a focus on autonomous vehicles. • Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base. – Establish library of courses for the Systems Engineering Experience Accelerator.			
Accomplishments/Planned Programs Subtotals	4.869	4.760	4.930

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Develop and extend fundamental knowledge, advanced methods, processes and tools and cutting edge techniques for systems engineering of complex designs of relevance to the DoD mission.

- Promulgation of advanced System Engineering approaches through research publications, presentations and monographs.
- Adoption of SERC methods, processes, and tools into DoD component activities.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense			Date: May 2017
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) P403 / *Engineered Resilient Systems*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
P403: *Engineered Resilient Systems*	0.000	9.739	9.741	9.946	-	9.946	9.978	9.875	4.879	5.030	Continuing	Continuing

A. Mission Description and Budget Item Justification

Engineered Resilient Systems (ERS) improves design agility and cost-effectiveness during analysis and development leading to improvements in testing, manufacturing, and fielding of mission-effective and adaptable systems. Its products are engineering design visualization and tool integration frameworks that will integrate physics-based models and engineering tools across acquisition disciplines to vastly improve the ability to perform tradespace and requirements analysis, iteratively optimize designs and improve architectures to reduce or eliminate sensitivity to adversary tactics and capability improvements, and adapt those designs over time. The goal is to achieve a vitally-needed transformation in the contribution of Defense systems engineering to design resilience and effectiveness across the systems lifecycle. These engineering improvements are essential to address a geopolitical environment marked by rapidly changing threats, tactics, missions and technologies, and fiscal constraints. The pace of change renders current point-design approaches unsustainable in both cost and time.

ERS research and development focuses on new concepts for implementing an integrated suite of modern computational engineering tools, models, simulations and related capabilities, and tradespace assessment and visualization tools within an architecture aligned with acquisition and operational business processes. These integrated tools will operate within a framework that supports data-driven decision-making in an innovative environment that provides advanced knowledge management, including data retention and lessons-learned, and enables multi-community collaboration. ERS leverages multi-fidelity physics-based models developed by the S&T community to inform the acquisition decision process (e.g., increased/easier utilization of High Performance Computing, web-based analysis with large data sets, and lifecycle cost sensitivity analysis). These new computational and model-based frameworks adapt advanced design and modeling approaches from Government, industry, and academia to enable our Nation to affordably deliver warfighting capability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Engineered Resilient Systems (ERS)	9.739	9.741	9.946
Description: ERS research and development focuses on new concepts for implementing an integrated suite of modern computational engineering tools, models, simulations and related capabilities, and tradespace assessment and visualization tools within an architecture aligned with acquisition and operational business processes. These integrated tools will operate within a framework that supports data-driven decision-making in an innovative environment that provides advanced knowledge management, including data retention and lessons-learned, and enables multi-community collaboration. ERS leverages multi-fidelity physics-based models developed by the S&T community to inform the acquisition decision process (e.g., increased/easier utilization of High Performance Computing, web-based analysis with large data sets, and lifecycle cost sensitivity analysis). These new computational and model-based frameworks adapt advanced design and modeling approaches from Government, industry, and academia to enable our Nation to affordably deliver warfighting capability.			
FY 2016 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P403 / *Engineered Resilient Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Conceptual, Computational, and World-wide Environmental Representation. Implemented surface water and watershed modeling capability to represent effects of hydrological impacts on systems of interest. Translated and utilized National Geospatial Intelligence Agency Geospatial Information System (GIS) data and common data production standards sponsored by the Modeling and Simulation Management (MSM) Office to build synthetic computational environments. This effort has been expanded to additional domains of the environment further in the development term. Mission-Relevant Engineering Tradespace Analysis. Developed next-generation tradespace tools that allow generation of multitudes of designs with many design parameters; within this data-rich space, analytically examine trades in design parameters and system performance across a range of military missions; provided means to visualize results in order to efficiently identify promising designs and key parameters; and incorporated lifecycle cost. Utilized High Performance Computing (HPC) capability for physics-based modeling of system performance with initial focus on select systems, such as ship platforms. Collaborative Engineering Analysis and Engineering Decision Making. Demonstrated and analyzed conceptual workflow methods using open standards to link mission-relevant tradespaces and systems engineering tools with operational simulations. Designed and implemented initial knowledge management environment for information sharing across DoD networks in preparation for service, agency, and industry use. Capability Integration and Demonstration. Conducted a series of focused evaluations across the services, academia, and industry to integrate components of synthetic environments, high-fidelity computational models, and tradespace analysis tools into the ERS architecture. Integrated and demonstrated tools with acquisition community partners. Identified lessons learned and improved the associated workflows and ERS components.			
FY 2017 Plans: Conceptual, Computational, and World-wide Environmental Representation. Develop simulations of wave dynamics under varying physical and relative conditions; apply physics to analysis, integration and testing of NGA, Air Force, Navy, and Army environmental data sets. Extend mission context analysis and evaluation to multiple environmental simulations. Test and integrate automatic computational scenario development with simulation parameter settings. Provide workflow management with user-selected model-based simulations. Mission-Relevant Engineering Tradespace Analysis. Design and test primary framework for ERS next-generation tradespace analysis tools providing user-requirements in data package management, statistical analysis, automated data storage and advanced visualization; Implement and test sub-system analysis in trades; Design and test user interfaces; Design integration of tradespace analytics with ERS open system in mapping to acquisition users requirements and Defense Acquisition processes; apply tradespace capability to fixed-wing manned/unmanned, ground vehicle, and modular ship design project demonstrations.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P403 / *Engineered Resilient Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Capability Integration and Demonstration. Enrich and extend open architecture design by collecting and integrating DoD acquisition and industry user requirements, implemented in an initial, open system model for feedback, evaluation, and enhancements. Design and evaluate information assurance security architecture, vulnerability analysis, and integrate intellectual property management capability. Map advanced ERS tools and capabilities to Defense acquisition processes and fully integrate distributed, lifecycle cost models. Collaborative Engineering Analysis and Engineering Decision-making. Develop robust methods to protect industry intellectual property and provide lessons-learned repository for creating and collaborating between DoD research & development, DoD acquisition, and industry partners. Provide mature knowledge management environment for tradespace analysis using facilities at the Defense Technical Information Center. ***FY 2018 Plans:*** Conceptual, Computational, and World-wide Environmental Representation. Develop simulations of ground vehicle dynamics under varying physical and relative conditions; apply physics to analysis, integration and testing of NGA, Air Force, Navy, and Army environmental data sets. Continue to extend mission context analysis and evaluation to multiple environmental simulations. Test and integrate automatic computational scenario development with simulation parameter settings. Provide automated workflows with user-selected model-based simulations. Mission-Relevant Engineering Tradespace Analysis. Improve and test primary framework for ERS next-generation tradespace analysis tools providing user-requirements in data package management, statistical analysis, automated data storage and advanced visualization; Implement and test sub-system analysis in trades; enhance and test user interfaces; enhance integration of tradespace analytics with ERS open system in mapping to acquisition users requirements and Defense Acquisition processes; apply tradespace capability to fixed-wing manned/unmanned, ground vehicle, modular ship design and service requested Joint Capability Technology Demonstration projects. Capability Integration and Demonstration. Enrich and extend open architecture design by collecting and integrating DoD acquisition and industry user requirements, implemented in an open system model, allowing for feedback, evaluation, and enhancements. Implement and evaluate information assurance security architecture, perform vulnerability analyses, and integrate intellectual property management capability within can ERS computational framework. Align ERS tools and capabilities to Defense acquisition processes.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense		Date: May 2017
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** P403 / *Engineered Resilient Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Collaborative Engineering Analysis and Engineering Decision-making. Enhance established methods to protect industry intellectual property and provide lessons-learned repository for creating and collaborating between DoD research & development, DoD acquisition, and industry partners. Provide mature knowledge management environment for tradespace analysis using facilities at the Defense Technical Information Center.			
Accomplishments/Planned Programs Subtotals	9.739	9.741	9.946

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

- Development of a technological capability for DoD Science and Technology, academia, industry, and the requirements/acquisition communities to collaborate and provide an innovative and more effective means for engineering.
- Demonstration and evaluation of next-generation engineering methods and design tools, documented in analyses and technical reports.
- Use of Engineered Resilient Systems engineering methods and design tools.