Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	257.275	35.860	45.626	40.030	-	40.030	-	-	-	-	-	-
142: *Systems Engineering*	255.275	33.860	39.226	16.985	-	16.985	-	-	-	-	-	-
842: *Mission Engineering*	2.000	2.000	4.400	13.096	-	13.096	-	-	-	-	-	-
144: *Program Engagement and Independent Assessments*	-	0.000	0.000	9.949	-	9.949	-	-	-	-	-	-
078: *Integration Technology and Tools*	0.000	0.000	2.000	0.000	-	0.000	-	-	-	-	-	-

Note

In FY 2022, funding is realigned from Project Code 142 (Systems Engineering) and Project Code 078 (Integration Technology and Tools) to create new Project Code 144 Program Technical Assessments and to fund emerging requirements within Project Code 842 Mission Engineering. These changes reflect the new organizational structure within the Deputy Director, Engineering: an increased focus on Mission Engineering activities (P842) as key enablers for technology development investment decisions and a refinement of focus that limits Program Technical Assessments (including Independent Technical Risk Assessments (ITRAs)) to Major Defense Acquisition Programs (MDAPs).

A. Mission Description and Budget Item Justification

This Program Element (PE) establishes the dedicated funding line to carry out the systems engineering and mission integration duties as described in DoDD 5137.02, “Under Secretary of Defense for Research and Engineering (USD(R&E)),” dated July 15, 2020. It also implements guidance and responsibilities as described in the FY 2017 National Defense Authorization Act (NDAA) Section 855 titled "Mission Integration Management (MIM)" and establishes Mission Engineering as the technical instantiation of MIM. Further, beginning in FY 2022, it includes efforts to implement the Software Science and Technology Strategy developed in response to the FY 2020 NDAA Section 255 titled “Department-wide Software Science and Technology Strategy” and other activities to lead improvement of software engineering across the Department. This strategy and the corresponding activities increase Joint Force readiness, resiliency, adaptability, and lethality by leading and facilitating near-term solutions to rapid technological advances and changes; and, leveraging existing commercial sector and Defense Industrial Base technology to the maximum extent possible.

In alignment with the National Defense Strategy (NDS), the Systems Engineering (SE) PE supports a more lethal force by analyzing near-, mid-, and long-term approaches to realizing mission capability, assessing that capability against anticipated adversaries in relevant operational environments, and determining revised system, architectural, and technology surprise opportunities to maintain tactical edge. Furthermore, it identifies opportunities to insert technology, improve interoperability, and formulate long-term strategies to retain or improve our capabilities against our adversaries. Deputy Director, Engineering (DD, Eng) oversees, initiates, and recommends opportunities to align technology investments to accelerate capability delivery, or modify existing systems. This program supports:

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(1) Reforming the Department for greater performance and affordability by maintaining visibility into major programs and conducting independent technical risk assessments (ITRAs) or other program assessments to advise the Under Secretary of Defense for Research and Engineering (USD(R&E)) and Milestone Decision Authorities, and programs on progress towards achieving key performance parameters, technology maturation, interoperability, and cyber security posture;
(2) Modernizing key capabilities and mission priorities through technical support for Mission Engineering (ME) analysis, development of technical mission and capability System of System (SoS) reference architecture (referred to as Government Reference Architectures), and establishment of a ME technical infrastructure and knowledge management system / data repository; and
(3) Cultivating workforce talent by both developing engineering methods, policies, processes, and tools that are cross cutting technologies and integrating technical disciplines to advance DoD engineering practices and providing advocacy and oversight for the Department's engineering workforce to build a capable, current, and innovative engineering workforce.

In FY 2021, DoD Modeling and Simulation Coordination Office (MSCO) funding, Engineered Resilient Systems (ERS), and Systems Engineering Research Center (SERC) activities aligned with the national defense modernization priorities and transitioned from Engineering Science and Technology (PE 0603833D8Z) to Systems Engineering (PE 0605142D8Z). Additionally, the Test & Evaluation Policy Workforce transferred from Development Test & Evaluation (PE 0605804D8Z) to Systems Engineering (PE 0605142D8Z).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	37.140	49.376	42.699	-	42.699
Current President's Budget	35.860	45.626	40.030	-	40.030
Total Adjustments	-1.280	-3.750	-2.669	-	-2.669
• Congressional General Reductions	-	-3.750			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.274	-			
• Program Adjustments	-0.006	-	-2.669	-	-2.669

Change Summary Explanation

The FY 2022 funding request was reduced by $2.134 million to account for the availability of prior year execution balances and includes reduction for non-pay, non-fuel inflation.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 142 / *Systems Engineering*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
142: *Systems Engineering*	255.275	33.860	39.226	16.985	-	16.985	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project Code 142 activities include the following functions:

• Support acceleration of USD(R&E)'s modernization initiatives and Principal Directors' Science and Technology (S&T) roadmap investments.

• Develop and establish DoD-level policy, guidance, and workforce development efforts ensuring systems engineering rigor in acquisition to drive the development of fully capable and supportable weapons systems.

• Advance the principles of interoperability, integration, modularity, and open systems to improve requirements, architecture, design, development and overall acquisition and sustainment of weapon systems.

• Develop education and training materials for instructing, maintaining, and enhancing the defense acquisition workforce. Activities include: (1) developing guidance to enhance Engineering and Technical Management (ETM) and Test and Evaluation (T&E) acquisition career planning and progression; and (2) monitoring and facilitating Defense Acquisition University (DAU) updates to the systems engineering, quality and specialty engineering courses, to ensure the curriculum represents the education and training requirements necessary to be a viable team member in the acquisition process.

• Improve the DoD's capabilities in specialty engineering and software engineering through policy, program oversight, fostering practice and technology improvements, initiating long-term strategic improvements, and collaborating with industry.

• Advance DoD engineering practices through the development and use of methods, processes, and tools, such as digital engineering, modeling and simulation, and model-based systems engineering, for engineering on weapon systems.

• Serve as the Defense Standardization Executive and oversee the Defense Standardization Program.

The following efforts are being re-aligned to Project Code 144, Development Test Evaluation and Assessments, starting in FY 2022:

• Provide Systems Engineering support to MDAPs. Review the systems engineering plans (SEPs) and activities for major defense acquisition programs (MDAPs).

• Monitor and advise Under Secretary of Defense (Research and Engineering) (USD(R&E)) and Under Secretary of Defense (Acquisition and Sustainment) (USD(A&S)) on technical and engineering aspects of MDAPs and select alternate acquisition pathway programs to ensure they are adequate to support fielding and the achievement of cost, schedule and performance goals to include readiness, i.e. producibility, reliability, maintainability, sustainment, and other considerations.

• Conducts and approves independent technical risk assessments (ITRAs) on ACAT-1D MDAPs. Reviews and approves ITRAs on select high priority ACAT 1B/1C MDAPs.

• Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAPs under the Office of the Secretary of Defense (OSD) purview.

• Provides basis for critical technology and manufacturing process determinations and certifications of MDAPs under OSD purview in support of U.S.C. 10 Sec 2366 requirements.

• Provide risk assessments to support the development of cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a.

• Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy.

• Conduct other technical reviews as requested, such as Nunn-McCurdy certification reviews, Non-Advocate Reviews, focused technical assessments, and software readiness reviews to identify and mitigate program risk.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
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• Oversee Service and other Component organizations' implementation of engineering initiatives and approve or conduct independent assessments.
• Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Systems Engineering	33.860	30.226	15.985
FY 2021 Plans: Strategic Thrust: Program Support/Technical Risk Assessments (Re-aligned to Project Code 144 Program Engagement and Independent Assessments in FY 2022) • Enhance independent technical risk assessment. • Provide risk assessments to support cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a. • Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy. • Provide engineers and technical leaders to develop and integrate technologies and modernization priorities. • Continued support to acquisition program managers in developing and documenting viable technical management approach. • Conduct technical reviews of acquisition to confirm program execution in accordance with systems engineering plans. • Provides Specialty Engineering support to ITRAs and other assessments. Strategic Thrust: Workforce Development • Streamline the current Engineering (ENG), Production, Quality, and Manufacturing (PQM), and Science & Technology (S&TM) career fields into a single Engineering and Technical Management (ETM) Career Field. • Serve as Functional Lead for ETM and Test and Evaluation (T&E) Career Fields. • Establish Competency Models for both the ETM and T&E Career Fields. • Establish Educational, Training, and experience requirements for T&E and ETM Career Fields that align with USD(A&S) Acquisition Workforce Transformation efforts. • Identify and establish requirements for Credentials in both the ETM and T&E Career Fields. • Provide leadership and advocacy for all Department non-construction engineering and quality assurance personnel. • Build an enduring high performance engineering/T&E culture across the Department. • Update and deploy courses with increased technical rigor and complex, case-based exercises. • Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess ETM and T&E workforce capability and capacity, and, working with Services and other components organizations, develop strategies to address identified gaps. Strategic Thrust: Engineering Policy and Guidance • Develop and update core Engineering and T&E policy, guidance and standards; review all acquisition policy for Engineering and T&E implications.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Develop Engineering and T&E guidance and policies for the acquisition process including requirements for use in alternate acquisition pathways. • Develop policy and guidance on inter-System of Systems (SoS) architecture analysis, system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps. • Assess challenges and impacts and develop new guidance, best practices, methods, processes and tools to more effectively implement Engineering for product lines and system of systems (SoS). Strategic Thrust: Specialty Engineering/Software Engineering • Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process including, but not limited to: manufacturing engineering; reliability and maintainability engineering; human systems integration; and value engineering. • Conduct software modernization studies and prototype activities to address challenges and opportunities and develop and promulgate best practices and guidance for applying software engineering principles, concepts, and practices in defense acquisition programs. • Conduct activities to develop and implement plans to enhance the specialty engineering and software engineering workforce. Strategic Thrust: Engineering Tools and Environments • Develop and sustain the Digital Engineering Community of Practice that concentrates on sharing best practices, developing solutions to common concerns, and establishing a body of knowledge repository that is flexible to serve varying uers' viewpoints across the DoD. • Apply digital engineering practices and body-of-knowledge information, to include using model-based processes, products, training, data/model management, to support analysis of prototype development efforts, ease integration of emerging technologies, and gauge impacts on overall mission performance. • Provide digital engineering implementation inputs to policy, guidance, and engineering workforce competency efforts. • Lead Digital Engineering infrastructure and application response efforts for the Department. Strategic Thrust: Connect the Engineering Community • Identify the current needs and specific implementations of engineering users of digital tools and environments, leading to unified effort to establish a connected engineering community, sharing tools, methods and data in order to provide engineering quality data to support decision makers. • Experiment with new computational capabilities (e.g. cloud) to discover the benefits and challenges for the engineering community. • Pilot development and use of a decision support environment and appropriate fidelity simulations for trade space analysis and performance determination.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Establish an engineering user board to identify, assess, and transition worthwhile and evolving technologies (advanced process flow, physics-based simulations, etc.) as computational/digital methods for use in engineering activities. • Identify Knowledge Management techniques to provide systematic approaches for information and knowledge flow to and between the stakeholders at the right time for the right use. • Establish cooperative relationships with IT governing elements to evolve useful tools and methods; identify barriers to implementing engineering-needed solutions and identify gaps in IT solution space offerings. Strategic Thrust: Modeling and Simulation (M&S) • Transform the Defense Modeling and Simulation Coordination Office into the Model and Simulation Enterprise with a focus on reestablishing and leading the Defense Model and Simulation Enterprise Community of Practice (CoP) to increase the effective and efficient development and use of methods, processes, and tools for the model and simulation community. • Lead the development and collation of stakeholders' model and simulation challenges as the nexus for the community of practice and the resulting body of knowledge development to enable the Department's full spectrum of M&S activities. • Plan the transformation of the model and simulation suite of knowledge management tools to enable discoverability and reuse of joint and cross-cutting capabilities. • Re-focus model and simulation standards activities from process management to technical leadership and involvement, supporting the needs of stakeholders and future users, in model/simulation interoperability, model/simulation characterization and curation. • Evaluate model/simulation issuances for currency and suitability, and evolve the relevant model and simulation policies and guidance, using the community of practice challenges as a guide in prioritization. Assess the impacts of external policies and guidance on the model and simulation community, and vice versa.			
FY 2022 Plans: Strategic Thrust: Workforce Development • Streamline the current Engineering (ENG), Production, Quality, and Manufacturing (PQM), and Science & Technology (S&TM) career fields into a single Engineering and Technical Management (ETM) Career Field. • Serve as Functional Lead for ETM and Test and Evaluation (T&E) Career Fields. • Establish Competency Models for both the ETM and T&E Career Fields. • Establish Educational, Training, and experience requirements for T&E and ETM Career Fields that align with USD(A&S) Acquisition Workforce Transformation efforts. •Identify and establish requirements for Credentials in both the ETM and T&E Career Fields. • Provide leadership and advocacy for all Department non-construction engineering and quality assurance personnel. • Build an enduring high performance engineering/T&E culture across the Department. • Update and deploy courses with increased technical rigor and complex, case-based exercises.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess ETM and T&E workforce capability and capacity, and, working with Services and other components organizations, develop strategies to address identified gaps. Strategic Thrust: Engineering Policy and Guidance • Develop and update core Engineering and T&E policy, guidance and standards; review all acquisition policy for Engineering and T&E implications. • Develop Engineering and T&E guidance and policies for the acquisition process including requirements for use in alternate acquisition pathways. • Develop policy and guidance on inter-System of Systems (SoS) architecture analysis, system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps. • Assess challenges and impacts and develop new guidance, best practices, methods, processes and tools to more effectively implement Engineering for product lines and system of systems (SoS). Strategic Thrust: Specialty Engineering/Software Engineering • Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process including, but not limited to: manufacturing engineering; reliability and maintainability engineering; human systems integration; and value engineering. • Conduct studies and analyses to identify challenges and opportunities to develop and promulgate best practices and guidance for applying software engineering principles, concepts, and practices in defense acquisition programs. • Conduct activities to develop and implement plans to enhance the specialty engineering workforce. Strategic Thrust: Engineering Tools and Environments • Develop and sustain the Digital Engineering Community of Practice that concentrates on sharing best practices, developing solutions to common concerns, and establishing a body of knowledge repository that is flexible to serve varying uers' viewpoints across the DoD. • Apply digital engineering practices and body-of-knowledge information, to include using model-based processes, products, training, data/model management, to support analysis of prototype development efforts, ease integration of emerging technologies, and gauge impacts on overall mission performance. • Provide digital engineering implementation inputs to policy, guidance, and engineering workforce competency efforts. • Lead Digital Engineering infrastructure and application response efforts for the Department. Strategic Thrust: Connect the Engineering Community			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Identify the current needs and specific implementations of engineering users of digital tools and environments, leading to unified effort to establish a connected engineering community, sharing tools, methods and data in order to provide engineering quality data to support decision makers. • Experiment with new computational capabilities (e.g. cloud) to discover the benefits and challenges for the engineering community. • Pilot development and use of a decision support environment and appropriate fidelity simulations for trade space analysis and performance determination. • Establish an engineering user board to identify, assess, and transition worthwhile and evolving technologies (advanced process flow, physics-based simulations, etc.) as computational/digital methods for use in engineering activities. • Identify Knowledge Management techniques to provide systematic approaches for information and knowledge flow to and between the stakeholders at the right time for the right use. • Establish cooperative relationships with IT governing elements to evolve useful tools and methods; identify barriers to implementing engineering-needed solutions; identify gaps in IT solution space offerings. Strategic Thrust: Modeling and Simulation (M&S) • Transform the Defense Modeling and Simulation Coordination Office into the Model and Simulation Enterprise with a focus on reestablishing and leading the Defense Model and Simulation Enterprise Community of Practice (CoP) to increase the effective and efficient development and use of methods, processes, and tools for the model and simulation community. • Lead the development and collation of stakeholders' model and simulation challenges as the nexus for the community of practice and the resulting body of knowledge development to enable the Department's full spectrum of M&S activities. • Plan the transformation of the model and simulation suite of knowledge management tools to enable discoverability and reuse of joint and cross-cutting capabilities. • Refocus model and simulation standards activities from process management to technical leadership and involvement, supporting the needs of stakeholders and future users, in model/simulation interoperability, model/simulation characterization and curation. • Evaluate model/simulation issuances for currency and suitability, and evolve the relevant model and simulation policies and guidance, using the community of practice challenges as a guide in prioritization. Assess the impacts of external policies and guidance on the model and simulation community, and vice versa. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes in funding level reflect re-alignment of efforts to new Project Code 144, Program Engagement and Independent Assessments and increased emphasis on Project Code 842 Mission Engineering.			
Title: Positioning, Navigation, and Timing (PNT) Open Architecture	-	9.000	1.000
Description: Build and validate common DoD open reference architecture standard for PNT systems:			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Common messaging/interface standards increases PNT system and element interoperability across the services. • Open architecture reduces future PNT system development/integration costs. • Common reference architecture guides development of service and platform specific PNT solutions. • Streamline integration of new complementary sensor technology into existing and future DoD systems. ***FY 2021 Plans:*** Continue initial development of a modular open system architecture for positioning, navigation, and timing (PNT) systems. Continue development of PNT interface standards based on previous work from the DARPA All-Source Positioning and Navigation (ASPN) program. ***FY 2022 Plans:*** Continue development of a modular open system architecture for positioning, navigation, and timing (PNT) systems. Continue development of PNT interface standards based on previous work from the DARPA All-Source Positioning and Navigation (ASPN) program. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is attributable to the completion of the bulk of the efforts in the Positioning, Navigation and Timing Open Architecture task.			
Accomplishments/Planned Programs Subtotals	33.860	39.226	16.985

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
842: *Mission Engineering*	2.000	2.000	4.400	13.096	-	13.096	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element (PE)/Project Code (Pcode) establishes a dedicated funding line to support the technical activities to carry out responsibilities described in the FY 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM) and supports the National Defense Strategy goals of developing new joint warfighting concepts and modernization of emerging capabilities to achieve a more lethal force.

In FY 2022, USD(R&E) will achieve full operational capability of the mission engineering framework that is being built in FY 2021 to instantiate the technical element of MIM and identify and promulgate best practices for mission-focused analyses and studies. This is to ensure the DoD applies engineering rigor to both operational and technical analysis of future capabilities to enable DoD leaders to make informed investment decisions and deliver technologies and capabilities to close mission gaps in response to new threats. Using this guidance, the USD(R&E) staff will execute multiple mission engineering studies in support of the National Defense Strategy modernization areas to identify technology solutions, advise on development of requirements, and develop Government Reference Architectures (GRA) for new joint warfighting capabilities. GRAs are a key enterprise document that will be used to guide and constrain development of capabilities that are required for warfighters to carry out operational and tactical missions against our adversaries.

USD(R&E) staff, in coordination with the Joint Staff, OSD/CAPE, USD/A&S, Combatant Commands, Services, and other stakeholders, will provide engineering analysis and studies at the campaign, mission, and engagement levels to support the prioritization and development of the Department's technology modernization and prototyping roadmaps. USD(R&E) will also continue to develop the technical infrastructure and analysis tools for engineering studies and data mining as well as modeling and simulation analytic tools to support this effort.

This effort also supports the analysis of "as is" operational and technical architectures of current joint capabilities and further support the development of "to be" GRAs of future required capabilities to align investment opportunities with emerging technological developments. It will also create opportunities to maintain a tactical edge by enabling innovative and timely application of new warfighting concepts, insertion of advanced capabilities on shorter timelines, improving interoperability, and formulating long-term strategies to retain or improve our technical overmatch against our adversaries.

Project Code 842 supports the following activities:
- Develop GRAs; establish enduring mission engineering analytic capability; instantiate a digital ecosystem to share knowledge amongst MIM / ME stakeholders.
- Participate in mission engineering activities by providing functional and program specific engineering expertise to support joint mission level analysis.
- Integrates models with advanced analytic and computational tools to enable rapid design and analysis of current and future weapon systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Mission Integration	2.000	4.400	13.096

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: • Establish initial operational capability and baseline for Mission Engineering (ME) as the technical component of Mission Integration Management (MIM). • Provide functional and program specific mission engineering expertise to support joint mission level analysis in the areas of hypersonics, directed energy, cyber, electromagnetic spectrum, joint Command and Control (C2), NC3, PNT, and others as directed by USD(R&E). • Perform engineering studies to establish metrics, resource estimates, and program impacts to inform Program Objective Memorandum; Planning, Programming, Budgeting, and Execution, and other financial management analyses such as the Strategic Portfolio Reviews conducted by OSD/CAPE. • Perform high-level executable system of system architecture trades and analyses for product line and technology to address mission capability gaps. • Support the development of the Joint All Domain Command & Control (JADC2) and the Fully Networked Command, Control, and Communications (FNC3) GRAs. • Continue to develop and instantiate the technical and digital infrastructure to perform mission engineering analysis, promote sharing of data, curation of models, hosting of analytic tools, and execution of simulations. • Identify a repeatable process and tool to establish data relationships to enable discovery, standardization, and usability of the data across DoD for mission engineering analyses. • Support for Nuclear Command, Control, and Communications (NC3) governance; conduct NC3 mission engineering studies to support development of GRAs and provide recommendations for research and development efforts; and support the development of the NC3 Modernization Alignment White Paper and Annual R&D Plan. • Ensure USD(R&E) participation in the Joint Capabilities Integration and Development System (JCIDS) and Joint Force Integration Cell (JFIC)efforts to support development and maturation of new joint warfighting concepts; and enhance capability integration and development of systems requirements. • Support: (1) Services and COCOMs in pre-Milestone (MS) A formulation; (2) requirements analyses and analysis of alternatives; (3) development of architectures to guide prototyping and experimentation roadmaps; and (4) inform initial capabilities document definition and development.			
FY 2022 Plans: • Fully implement the ME analytical framework as the technical component of MIM and expand its use across government and industry. • Provide functional and program specific mission engineering expertise to support joint mission level analysis in the areas of contested logistics, hypersonics, electromagnetic spectrum, joint C2, NC3, directed energy, autonomy, missile defense, and others as directed. • Perform high-level executable system of system architecture trades and analyses for product line and technology to address mission capability gap derived from new joint warfighting concepts, strategic portfolio reviews, and national defense guidance.			

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Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 842 / *Mission Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Develop and update government reference architectures for selected programs within the USD(R&E) modernization areas, in particular Future Networked C3 (FNC3), directed energy, hypersonics, and cyber. • Maintain the architecture guidance and the publication of a Mission Engineering Guide and support associated training material across DoD and industry partners. • Expand mission engineering support for up to six high priority mission sets as determined by USD(R&E) and support decisions for identification of joint mission-based prototyping projects. • Develop methods for governing changes and managing technical data for GRAs. Develop and conduct training in use of reference architectures. • Perform architecture tradeoff analyses to enable effective mission engineering and manage integration of emerging technologies with systems in development and / or in operation. Leverage this information to assist USD(A&S) with its Capability Portfolio Management process to ensure current systems maintain relevancy in the future warfare environment. • Perform architecture assessments to verify compliance of major systems interfaces through use of standards. Provide recommendations to improve joint and allied interoperability. • Execute system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps analysis. • Instantiate a knowledge management system and continue to develop the technical infrastructure to perform mission engineering analysis, promote sharing of data, curation of models, hosting of analytic tools, and execution of simulations. • Further mature and maintain processes and tools required to establish data relationships to enable discovery, standardization, and usability of the mission engineering data across DoD. • Continue the support for NC3 governance activities; conduct NC3 mission engineering studies to support development of GRAs and provide recommendations for research and development efforts; and support the development of the NC3 Modernization Alignment White Paper and Annual R&D Plan. • Expand USD(R&E) participation in the Joint Capabilities Integration and Development System (JCIDS) and Joint Force Integration Cell (JFIC) efforts to support development and maturation of new joint warfighting concepts; enhance capability and development of systems requirements through mission engineering insights. • Support: (1) Services and COCOMs in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; (3) architectures to guide development of prototyping and experimentation roadmaps; and (4) inform initial capabilities document definition and development. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Change in funding level is due to a re-alignment and expansion of efforts in this Program Element (PE), to fully implement and accurately reflect Mission Integration Management and Mission Engineering activities as directed by law.			
Accomplishments/Planned Programs Subtotals	2.000	4.400	13.096

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 842 / *Mission Engineering*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 144 / *Program Engagement and Independent Assessments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
144: *Program Engagement and Independent Assessments*	-	0.000	0.000	9.949	-	9.949	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New Project Code created, in FY 2022, to accurately reflect requirements supported by Development Test Evaluation and Assessment activities.

A. Mission Description and Budget Item Justification

Development Test Evaluation and Assessment activities include the following functions:
• Provide Systems Engineering support to MDAPs. Review the systems engineering plans (SEPs) and activities for major defense acquisition programs (MDAPs).
• Monitor and advise USD(R&E) and USD(A&S) on technical and engineering aspects of MDAPs and select alternate acquisition pathway programs to ensure they are adequate to support fielding and the achievement of cost, schedule and performance goals to include readiness, i.e. producibility, reliability, maintainability, sustainment, and other considerations.
• Conceive plans and lead independent technical risk assessments and command directed technical risk assessments of MDAP under OSD purview and other select alternate acquisition programs to ensure program success. Conducts or approves ITRAs on MDAPs.
• Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAP under OSD purview.
• Provides basis for critical technology and manufacturing process determinations and certifications of MDAP under OSD purview in support of U.S.C. 10 Sec 2366 requirements.
• Provide risk assessments to support the development of cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a.
• Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy.
• Conduct other technical reviews as requested, such as Nunn-McCurdy certification reviews, Non-Advocate Reviews, focused technical assessments, and software readiness reviews to identify and mitigate program risk.
• Oversee Service and other Component organizations implementation of engineering initiatives and approve or conduct independent assessments.
• Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Development Test Evaluation and Assessments	-	-	9.949
FY 2022 Plans: Strategic Thrust: Program Support/Technical Risk Assessments • Enhance and continue to conduct or approve independent technical risk assessments of MDAPs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 144 / *Program Engagement and Independent Assessments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Monitor and advise USD(R&E) and USD(A&S) on technical and engineering aspects of MDAPS and select alternate acquisition pathway programs. • Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAP under OSD purview. • Provide basis for critical technology and manufacturing process determinations and certifications of MDAP under OSD purview in support of U.S.C. 10 Sec 2366 requirements. • Provide risk assessments to support cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a. • Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy. • Provide engineers and technical leaders to develop and integrate technologies and modernization priorities. • Continued support to acquisition program managers in developing and documenting viable technical management approach. • Conduct technical reviews of acquisition to confirm program execution in accordance with systems engineering plans. • Provides Specialty Engineering support to ITRAs and other assessments. • Perform early acquisition risk assessment including pre-MS A engagement with Joint Requirements Oversight Council processes. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** New Project Code (Pcode) 144 created to accurately capture Development, Test, Evaluation and Assessments activities.			
Accomplishments/Planned Programs Subtotals	-	-	9.949

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 078 / *Integration Technology and Tools*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
078: *Integration Technology and Tools*	0.000	0.000	2.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2022, funding from this Project Code is re-aligned within this Program Element for other mission priorities.

A. Mission Description and Budget Item Justification

Project Code 078 supports the National Defense Strategy goals of developing a more lethal force by instituting enterprise-wide research, methods, practices and tools to: improve systems engineering practices; support modular, rapid fielding of mature warfighting capabilities; and use common, reusable hardware and software components that can be more readily adapted and refreshed, allowing DoD to deploy and support the latest technologies. The project also sustains the ability to identify and/or create innovative methods and tools in systems engineering practice to improve the Department's ability to develop and deploy complex weapon systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Integration Technology and Tools	-	2.000	0.000
FY 2021 Plans: Strategic Thrust: Modular Open Systems Approach • Develop and sustain modular open systems approaches (MOSA) across the Department through policy, guidance, standards, and major program support. • Develop comprehensive engineering methods for development and use of modular and open architectures to support integration of emerging technologies. • Develop and use a common semantic framework to enable modular open architectures and cross-domain tool interoperability, compatibility and re-use. • Establish MOSA Technical Evaluation that assesses an acquisition technical approach for modular design practices included in (1) technical plan, (2) architecture, and (3) design to develop a technical solution with a modular open system approach. • Provide Methods, Processes, and Tools to manage MOSA Business Practices for Intellectual Property and Technology Data Management; provide the ability for competition of replacement elements, when properly supported by appropriate data rights/ intellectual property access. • Develop MOSA common descriptions/definitions, contract language, cybersecurity in MOSA systems, implementation guidance, and standards. Strategic Thrust: Systems Engineering Research Center (SERC)			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 078 / *Integration Technology and Tools*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Sustain capabilities that support innovation and the use of critical technology for emergent and evolving mission objectives. ***FY 2022 Plans:*** Strategic Thrust: Modular Open Systems Approach • Continue the development and sustainment of modular open systems approaches (MOSA) across the Department through policy, guidance, standards, and major program support. • Support comprehensive engineering methods for development and use of modular and open architectures to support integration of emerging technologies. • Support and use a common semantic framework to enable modular open architectures and cross-domain tool interoperability, compatibility and re-use. • Provide expertise in MOSA Technical Evaluations that assesses an acquisition technical approach for modular design practices. • Provide expertise in Methods, Processes, and Tools to manage MOSA Business Practices for Intellectual Property and Technology Data Management. • Continue to refine and develop MOSA common descriptions/definitions, contract language, cybersecurity in MOSA systems, implementation guidance, and standards. Strategic Thrust: Systems Engineering Research Center (SERC) • Sustain capabilities that support innovation and the use of critical technology for emergent and evolving mission objectives. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	-	2.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A