Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Office of the Secretary Of Defense	Date: March 2023
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603781D8Z / *Software Engineering Institute (SEI)*

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	14.127	12.306	16.699	-	16.699	17.119	17.525	17.890	18.281	Continuing	Continuing
781: *Software Engineering Institute (SEI)*	-	14.127	12.306	16.699	-	16.699	17.119	17.525	17.890	18.281	Continuing	Continuing

Note

New Start (Y/N): No

This Software Engineering Institute (SEI) Advanced Technology Development Program Element (PE) applies the software and computer science concepts developed under the 0602751D8Z PE to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive Department of Defense (DoD) systems.

A. Mission Description and Budget Item Justification

This program supports the Departments initiatives to Build a Sustainable and Long-Term Advantage, and Build a Resilient Joint Force and Defense Ecosystem.

Software is more pervasive than ever, and computer programs are growing in size and complexity. Designing, managing, and securing integrated, complex, and large-scale mission-critical systems are abilities that the Department of Defense (DoD) and the Defense Industrial Base (DIB) have not yet mastered. Reliance on software-intensive mobile and net-based products and systems has increased (e.g., Joint Tactical Radio System, USS ZUMWALT (DDG-1000), Joint Strike Fighter, F-22, and Army Modernization). As stated in the February 2018 Defense Science Board Report, “Design and Acquisition of Software for Defense Systems,” software is a crucial and growing part of weapons systems and the national security mission, and the DoD must address its ability to build and sustain software continuously and indefinitely. With growing global parity in software engineering, the DoD must maintain leadership to ensure a competitive advantage.

The Software Engineering Institute (SEI) Federally Funded Research and Development Center (FFRDC) was established in 1984 as an integral part of the DoD’s initiative to identify, evaluate, and transition software engineering technologies and practices. The mission of the SEI is to provide the DoD with technical leadership and innovation through research and development to advance the practice of software engineering and technology. The SEI works across government, industry, and academia to improve the state of software engineering from the technical, acquisition, and management perspectives. The SEI engages in research and development of critical software technologies and tools and collaborates with the larger software engineering research community. It facilitates rapid transition of software engineering technologies into practice and evaluates emerging software engineering technologies to determine their potential for improving software-intensive DoD systems. Since its inception, the SEI has helped to transform the fields of software engineering and acquisition, network security, real-time systems, software architectures, and software-engineering process management.

The SEI Program Element (PE) addresses the critical need to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive DoD systems. The

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research conducted by this PE directly benefits the technical domains, such as Command, Control, Communications, Computers, and Intelligence (C4I), Autonomy and Artificial Intelligence (AI), Cyber, and Engineered Resilient Systems.

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	14.631	13.417	16.993	-	16.993
Current President's Budget	14.127	12.306	16.699	-	16.699
Total Adjustments	-0.504	-1.111	-0.294	-	-0.294
• Congressional General Reductions	-	-1.111			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.502	-			
• Program Adjustments	-0.002	-	-0.294	-	-0.294

Change Summary Explanation

FY 2024 reduction of $0.294 million is comprised of a realignment of $0.370 million to support the Historically Black Colleges and Universities/Minority Serving Institutions program, which is a priority of the Under Secretary of Defense for Research and Engineering (USD(R&E)), $0.018 million to support departmental priorities and an economic assumption increase of $0.094 million.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Office of the Secretary Of Defense			Date: March 2023
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603781D8Z / *Software Engineering Institute (SEI)*	Project (Number/Name) 781 / *Software Engineering Institute (SEI)*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
781: *Software Engineering Institute (SEI)*	-	14.127	12.306	16.699	-	16.699	17.119	17.525	17.890	18.281	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project focuses on two main research thrusts with known military applications: (1) Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance); and (2) Information Assurance.

Software Engineering Institute (SEI) research focuses on the most significant and pervasive software challenges within the Department of Defense (DoD), such as the scalability and reliability of software assurance, supply chain risk management, validation of and trust in autonomous systems, human-computer and human-technology teaming and interaction, computing and communication at the tactical edge, and efficiency and performance of acquisition strategies and software development appropriate for a contested cyber environment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: SEI Advanced Technology Development in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance	10.340	8.509	14.902
Description: This research seeks to mature and rapidly prototype techniques to verify methods for identifying requirements, systems of systems architectures, and virtual integration of components. Furthermore, research in this area will pursue rapid prototyping and transitioning of capabilities that verify requirements for software assurance, analysis/control of unverified code and automated repair of damaged code. Software production and code analysis methods developed through this program will also improve the ability to predict how complex software systems, including AI-enabled systems, will behave in untested environments. Increasingly, large numbers of lines of code and the addition of machine-learning techniques will require a commensurate increase in sophisticated verification and validation mechanisms. ***FY 2023 Plans:*** Develop new techniques to allow feedback between deployed software, software modeled through model-based systems engineering, and deployed systems. This approach can be automated using machine learning methods that enable comparison of online information systems performance with modeled systems performance in a variety of mission and application contexts. The intent of this approach in the applied areas is to implement as an information service for DoD platforms to utilize. ***FY 2024 Plans:*** Integrate techniques in system measurement, software development and operations, and model based systems engineering for an automated assessment, modeling, and software deployment process. Focus on strategies for resilience and mission			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
assurance in large complex infrastructures and develop prototype systems that can be transitioned and tested into DoD applications from cloud to embedded systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The increase of $6.393 between FY 2023 and FY 2024 reflects additional investment in developing system measurement techniques, along with system prototypes.			
Title: SEI Advanced Technology Development in the Area of Information Assurance ***Description:*** Powerful machine learning algorithms can be subverted by malicious manipulation or falsification of data collected through normal channels. Algorithms must be trusted and effective in the presence of adversaries. This thrust seeks to defend against and minimize the impacts of information falsification attacks. ***FY 2023 Plans:*** Enable verification and validation of systems at the embedded level through graph based models of embedded systems performance and integration of large collections of such embedded systems on complex command and control applications. The intent of this approach in the applied areas is to implement as an information service for DoD platforms to utilize. ***FY 2024 Plans:*** Enable combined risk analysis between software, machine learning, and cyber security to enable assessment and management of automated systems. These risk metrics will be introduced to a variety of DoD applications from system assessment, to enterprise cloud analytics, and legacy embedded systems.	1.787	1.797	1.797
Title: Artificial Intelligence Engineering Initiatives ***Description:*** Artificial Intelligence (AI) engineering is an emergent discipline focused on developing tools, systems, and processes to enable the application of AI in real-world contexts. The rise in availability of computing power and massive datasets have led to the creation of new AI, models, and algorithms encompassing thousands of variables and capable of making rapid and impactful decisions. Too often, though, these capabilities work only in controlled environments and are difficult to replicate, verify, and validate in the real world. The need for an engineering discipline to guide the development and deployment of AI capabilities is urgent. AI engineering aims to provide a framework and tools to proactively design AI systems to function in environments characterized by high degrees of complexity, ambiguity, and dynamism; and aims to equip practitioners to develop systems across the enterprise-to-edge spectrum, to anticipate requirements in changing operational environments and conditions, and to ensure human needs are translated into understandable, ethical, and thus trustworthy AI. ***FY 2023 Plans:***	2.000	2.000	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Enable the ability for a wide variety of researchers from DoD Research Laboratories to Federally Funded Research and Development Centers to access methods in distributed cloud and High Performance Computing Environments that enable risk analysis in machine learning and distributed computing infrastructure. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The decrease of $2.000 between FY 2023 and FY 2024 is the result of the completion of the Artificial Intelligence Engineering Initiatives effort.			
Accomplishments/Planned Programs Subtotals	14.127	12.306	16.699

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
• BA 2, RDT&E, PE # 0602751D8Z: *Software Engineering Institute Applied Research*	9.245	10.153	11.168	-	11.168	11.401	11.665	11.909	12.168	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A