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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army **Date:** March 2023

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603457A / <i>C3I Cyber Advanced Development</i>
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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	-	61.426	41.354	28.847	-	28.847	19.204	22.235	27.077	36.373	0.000	236.516
6CY: <i>Autonomous Cyber Advanced Technology</i>	-	9.304	11.188	7.528	-	7.528	4.629	11.907	16.867	26.035	0.000	87.458
8CY: <i>Information Trust Advanced Technology</i>	-	15.876	20.028	11.187	-	11.187	4.180	-	-	-	0.000	51.271
9CY: <i>Network Access and Effects Advanced Technology</i>	-	4.347	8.170	10.132	-	10.132	10.395	10.328	10.210	10.338	0.000	63.920
CB4: <i>Offensive Cyber Operations (OCO) Mirror Adv Tech</i>	-	1.899	1.968	-	-	-	-	-	-	-	0.000	3.867
CB6: <i>C3I Cyber Advanced Development (CA)</i>	-	30.000	-	-	-	-	-	-	-	-	0.000	30.000

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates technologies for offensive and defensive cyber operations in tactical environments. Projects optimize devices, techniques, services, software and algorithms to enable cyber situational understanding and Cyber Electromagnetic Activities (CEMA). For offensive cyber, efforts demonstrate integrated electronic attack (EA) and CEMA hardware and software to execute force protection (FP), EA, electronic surveillance (ES), signals intelligence (SIGINT), electronic warfare (EW) and cyber missions in a dynamic, distributed and coordinated fashion. For defensive cyber, efforts demonstrate hardware and software to protect tactical wired and wireless networks against modern cyber attacks and focuses on configuration, operation, monitoring, data integrity, and defense in bandwidth constrained tactical environments while reducing the operator workload required to conduct these functions.

This PE directly supports the Network Army Modernization Priority.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

UNCLASSIFIED

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603457A / <i>C3I Cyber Advanced Development</i>
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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	61.426	41.354	28.720	-	28.720
Current President's Budget	61.426	41.354	28.847	-	28.847
Total Adjustments	0.000	0.000	0.127	-	0.127
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	0.127	-	0.127

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: CB6: *C3I Cyber Advanced Development (CA)*

Congressional Add: *Program Increase - High Bandwidth Cryptomodule Enhancements and Certification*

Congressional Add Subtotals for Project: CB6

Congressional Add Totals for all Projects

	FY 2022	FY 2023
	30.000	-
	30.000	-
	30.000	-

Change Summary Explanation

Increased funding due to revised economic assumptions.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development				Project (Number/Name) 6CY / Autonomous Cyber Advanced Technology			
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
6CY: Autonomous Cyber Advanced Technology	-	9.304	11.188	7.528	-	7.528	4.629	11.907	16.867	26.035	0.000	87.458
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates defensive effects to adversarial use of artificial intelligence (AI) and machine learning (ML) to avoid detection and deceive our automated technologies driving the network decisions. This Project also provides cyber autonomy through science & technology advancements.

Work in this Project complements Program Element (PE) 0602213A (C3I Applied Cyber) / Project CY6 (Autonomous Cyber Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023	FY 2024
Title: Autonomous Cyber	9.304	11.188	7.528
Description: This effort will develop proof-of-concept sensors that can adapt to and autonomously react to adversary cyber-attack and develop a cyber response course of action decision aid for cyber defenders to validate suitability of actions and to speed response decisions.			
FY 2023 Plans: Mature and demonstrate AI/ML based cyber defense decision aid architecture supporting warfighter planning at a soldier run exercise; mature and demonstrate sensors that can adapt to and autonomously react to adversary cyber-attack at a soldier run exercise; mature Generative network algorithms and neural network software to simulate adversarial attacks on AI/ML algorithms along with defenses against such attacks to ensure trustworthiness of autonomous decision engines and mitigate vulnerable decisions, as well as demonstrate these capabilities in lab and field based demonstrations; mature cyber machine learning architecture to ensure the machine learning software can interoperate and be updated in tactical environment, which will be demonstrated in lab and field based demonstrations.			
FY 2024 Plans: Will conduct final demonstration of hierarchical machine learning reference architecture supporting standardization of cyber capabilities that proactively react to and defend against advanced cyber threats and machine learning-enabled cyber-attacks to			

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) 6CY I Autonomous Cyber Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
protect the network; conduct final assessment of the detection tools and autonomous decision-making system using adversarial attack simulation software tools to detect and self-mitigate any system vulnerabilities.				
FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned conclusion of multiple demonstrations required to validate and mature decision aid architectures, adaptive sensors and generative network algorithms for a final demonstration and assessment in FY24.				
Accomplishments/Planned Programs Subtotals		9.304	11.188	7.528
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development				Project (Number/Name) 8CY / Information Trust Advanced Technology			
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
8CY: Information Trust Advanced Technology	-	15.876	20.028	11.187	-	11.187	4.180	-	-	-	0.000	51.271
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates enhanced awareness of the information's "provenance" from originator to consumer (e.g. sensor to shooter) in the presence of cyber-attacks, such as an attempt to manipulate data traversing the network.

Work in this Project complements Program Element (PE) 06022213A (C3I Applied Cyber) / Project 2CY (Information Trust Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023	FY 2024
Title: Information Trust Advanced Technology	4.507	6.532	7.119
Description: This Project demonstrates enhanced awareness of the information's "provenance" from originator to consumer (e.g. sensor to shooter) in the presence of cyber-attacks, such as an attempt to manipulate data traversing the network.			
FY 2023 Plans: Continue to mature and demonstrate the specification based fixed format message checking and machine learning based integrity services that ensure the integrity of messages data, origin, and chain of custody as it traverses the network; optimize specification based and machine learning based integrity services and will demonstrate within high fidelity cyber emulation environment; continue to implement and mature technology to create a suitable de-centralized lightweight blockchain algorithm that can be leveraged to ensure a secure distributed ledger of messages and associated risk with automated analysis of attempted malicious modification; optimize the lightweight blockchain technology within a high fidelity cyber emulation environment; implement and mature technology to create a trust score architecture that provides a real-time and quantitative analytics based level of trustworthiness upon the data received from the integrity, authentication, and provenance tracker services.			
FY 2024 Plans: Will demonstrate a complimentary suite of software capabilities to ensure the integrity, authenticity and provenance of data traversing the tactical network; provide a machine learning based integrity service to ensure chain of custody, a blockchain-			

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) 8CY I Information Trust Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<p>enabled provenance tracker software, enabling automatic modification detection, and a trust score architecture for real-time, quantitative, analytics-based trustworthiness of messages and other data in transit in the presence of cyber attacks.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding increase will enable the demonstration of the authentication service.</p>				
<p>Title: Agile Virtual Enclave</p> <p>Description: This effort matures and demonstrates a Multi-Level Security (MLS) Access Guard to reduce hardware infrastructure required for US Government owned systems and develop a Mission Partner Environment (MPE) transfer cross domain solution (CDS) to enable data sharing with coalition partners.</p> <p>FY 2023 Plans: Continue development of a software solution for Army Mission Command (MC) systems to achieve secure and operationally adjustable data exchange between US Armed Forces tactical systems and MPE connected systems; mature Access and Transfer Guard components; conduct lab and field-based risk reduction activities; demonstrate and assess technology readiness levels for the integrated solution in a relevant environment and address Program Manager (PM) MC and National Security Agency (NSA) concerns prior to transition.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned conclusion of this effort and transition to PEO C3T, PM Mission Command, Command Post Computing Environment POR.</p>		11.369	13.496	-
<p>Title: PKI-Modernization/Dynamic Access Control for Tactical (DAC-T)</p> <p>Description: This effort will mature and demonstrate cryptographic algorithms that address Program Manager (PM) Mission Command (MC) gap of native ability to support PKI digital signature and Online Certificate Status Protocol (OCSP) certificate validation for the Variable Message Format (VMF) standard MIL-STD-2045-47001D in Disconnected, Interrupted, and Low-bandwidth (DIL) Networks.</p> <p>Furthermore, the effort will also mature and demonstrate dynamic fine-grained access control that migrates the Army from a network-centric to data-centric access control in alignment with Advanced zero trust principles by enhancing, speeding up and automating account provisioning and access for people and non-Person entities (NPE) (e.g., sensors, devices, web services, etc.). This will significantly reduce the workload/ burden for the soldier and improve the networks security posture by enforcing least privilege & just-in-time network access.</p> <p>FY 2024 Plans:</p>		-	-	4.068

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) 8CY I Information Trust Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
Will optimize PM MC cryptographic algorithms and Online Certificate Status Protocol (OCSP) certificate validation capability and conduct lab-based risk reduction to demonstrate and assess PKI Modernization impacts on Mounted Mission Command's (MMCs) ability to send digitally signed VMF messages; provide recommended courses of action to the current MIL-STD-2045-47001E.				
FY 2023 to FY 2024 Increase/Decrease Statement: Funding increase reflects planned initiation of this effort				
Accomplishments/Planned Programs Subtotals		15.876	20.028	11.187
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development				Project (Number/Name) 9CY / Network Access and Effects Advanced Technology			
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
9CY: Network Access and Effects Advanced Technology	-	4.347	8.170	10.132	-	10.132	10.395	10.328	10.210	10.338	0.000	63.920
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced mission management tools and workflows, to promote efficient selection and sequencing of effects to support the agile deployment and execution of Offensive Cyber Operations (OCO) / Radio Frequency (RF) Enabled capabilities.

Work in this Project complements Program Element (PE) 0602213A (C3I Applied Cyber) / Project 3CY (Network Access and Effects Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023	FY 2024
Title: Offensive Cyber Enabling Mission Support	4.347	8.170	-
Description: This effort matures and demonstrates advanced mission management tools and workflows, to promote efficient selection and sequencing of effects to support the agile deployment and execution of OCO / RF Enabled capabilities.			
FY 2023 Plans: Will demonstrate assisted technique development to reduce time to vector discovery via software transition. Will mature and demonstrate OCO/RF enabled effect technologies against priority target of interest. Will optimize the use of OCO/RF firing platforms against near-peer targets of interest with a scaled process while minimizing manual processing and operator burden.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned conclusion of this effort and transition to the program of record.			
Title: Network Exploitation Research and Development (NERD) Advanced Technology	-	-	10.132
Description: This effort will mature computer assisted/automated development of Offensive Cyber Operations (OCO)/Radio Frequency (RF) enabled effects against emerging and validated targets of interest (TOI) in conjunction with exploration of non-traditional attack vectors. Will mature automated mission planning and staging methodologies and tools to evaluate and compare various courses of actions that are dynamically replicated within appropriate rapid response environment to enable both mission			

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<p>planner and operators to cognitively keep pace with the complexity of near-peer engagements within Multi-Domain Operations (MDO).</p> <p>FY 2024 Plans: Will begin development of Non-Traditional Offensive Cyber Operations (OCO)/Radio Frequency (RF) enabled access and effects that account for and circumvent modern cyber security practices against expanded targets of interest; initiate development of tools to augment and automate vulnerability exploitation as well as access and effect capability development to reduce offensive cyber and RF enabled mission timelines.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding increase reflects planned initiation of this effort.</p>				
Accomplishments/Planned Programs Subtotals		4.347	8.170	10.132
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army **Date:** March 2023

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) CB4 / Offensive Cyber Operations (OCO) Mirror Adv Tech
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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
CB4: <i>Offensive Cyber Operations (OCO) Mirror Adv Tech</i>	-	1.899	1.968	-	-	-	-	-	-	-	0.000	3.867
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates methods, tools and techniques to enable rapid instantiation of an operationally relevant cyberspace environment supporting critical Offensive Cyber Operations (OCO) mission functions to include but not limited to development, exercise, mission rehearsal and provide technical reach back to units during operations.

Work in this Project complements Program Element (PE) 0602213A (C3I Applied Cyber) / Project 5CY (Offensive Cyber Operations (OCO) Mirror Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023	FY 2024
Title: Offensive Cyber Operations Mirror	1.899	1.968	-
Description: This effort matures and demonstrates methods, tools, and techniques to enable rapid instantiation of an operationally relevant cyberspace environment supporting critical OCO mission functions to include but not limited to development, exercise, mission rehearsal and provide technical reach back to units during operations.			
FY 2023 Plans: Demonstrate OCO Mirror Rev 3 product at annual Cyber Blitz test event. Transition OCO Mirror product Rev 3 at technology readiness level (TRL) 6. All OCO Mirror products will receive authorization to operate (ATO) on Top Secret level information systems.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned conclusion of this effort and transition to the program of record.			
Accomplishments/Planned Programs Subtotals	1.899	1.968	-

C. Other Program Funding Summary (\$ in Millions)

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) CB4 / Offensive Cyber Operations (OCO) Mirror Adv Tech

C. Other Program Funding Summary (\$ in Millions)

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army **Date:** March 2023

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development	Project (Number/Name) CB6 / C3I Cyber Advanced Development (CA)
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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
CB6: C3I Cyber Advanced Development (CA)	-	30.000	-	-	-	-	-	-	-	-	0.000	30.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
Congressional Interest Item funding provided for C3I Cyber Advanced Development.

A. Mission Description and Budget Item Justification
Congressional Interest Item funding provided for C3I Cyber Advanced Development.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023
Congressional Add: Program Increase - High Bandwidth Cryptomodule Enhancements and Certification	30.000	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for High Bandwidth Cryptomodule Enhancements and Certification		
Congressional Adds Subtotals	30.000	-

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
N/A