

UNCLASSIFIED

**Department of Defense
Fiscal Year (FY) 2023 Budget Estimates**

April 2022



Army

Justification Book Volume 1c of 1

Research, Development, Test & Evaluation, Army

RDT&E – Volume I, Budget Activity 3

UNCLASSIFIED

UNCLASSIFIED

Army • Budget Estimates FY 2023 • RDT&E Program

Volume 1c Table of Contents

Introduction and Explanation of Contents.....Volume 1c - ii
Comptroller Exhibit R-1..... Volume 1c - viii
Program Element Table of Contents (by Budget Activity then Line Item Number).....Volume 1c - xx
Program Element Table of Contents (Alphabetically by Program Element Title).....Volume 1c - xxii
Exhibit R-2s.....Volume 1c - 1

UNCLASSIFIED

UNCLASSIFIED
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, ARMY
APPROPRIATION LANGUAGE

For expenses necessary for basic and applied scientific research, development, test and evaluation, including maintenance, rehabilitation, lease, and operation of facilities and equipment, \$13,703,609,000.00 to remain available for obligation until September 30, 2024.

The FY 2023 Overseas Operations accounted for in the base budget are as follows:

Combat or direct combat support expenses that discontinue once combat operations end at major contingency location \$12,800,000.

In-theater and in-CONUS expenses that remain after combat operations cease and have been previously funded in OCO \$5,875,000.

COST STATEMENT

The following Justification Books were prepared at a cost of \$474,495.00: Aircraft (ACFT), Missiles (MSLS), Weapons & Tracked Combat Vehicles (WTCV), Ammunition (AMMO), Other Procurement Army (OPA) 1 – Tactical & Support Vehicles, Other Procurement Army (OPA) 2 – Communications & Electronics, Other Procurement Army (OPA) 3 & 4 - Other Support Equipment & Spares, Research, Development, Test and Evaluation (RDTE) for: Budget Activity 1, Budget Activity 2, Budget Activity 3, Budget Activity 4, Budget Activity 5A, Budget Activity 5B, Budget Activity 5C, Budget Activity 5D, Budget Activity 6, Budget Activity 7, and Budget Activity 8.

UNCLASSIFIED
FY 2023 RDT&E, ARMY PROGRAM ELEMENT DESCRIPTIVE SUMMARIES
Introduction and Explanation of Contents

1. **General.** The purpose of this document is to provide summary information concerning the Research, Development, Test and Evaluation, Army program. The descriptive summaries are comprised of R-2 (Army RDT&E Budget Item Justification – program element level), R-2A (Army RDT&E Budget Item Justification – project level), R-3 (Army RDT&E Cost Analysis), R-4 (Schedule Profile Detail) and R-5 (Termination Liability Funding for MDAPs) Exhibits, which provide narrative information on all RDT&E program elements and projects through FY 2022.

2. **Relationship of the FY 2023 Budget Submitted to Congress to the FY 2022 Budget Submitted to Congress.** This paragraph provides a list of program elements/projects that are major new starts, restructures, developmental transitions, and terminated programs. Explanations for these changes can be found in the narrative sections of the Program Element R-2A Exhibits.

New Start Programs:

<i>Budget Activity</i>	<i>OSDPE / Project</i>	<i>Project Title</i>
02	0602002A / DC4	Army Applied Innovation
02	0602002A / DC5	Team Ignite
02	0602141A / CII	Advanced Armaments Lethality Technology
02	0602141A / CZ9	Foundational Hypersonic Weapons Research
02	0602144A / CV3	Engineer Enablers Maneuver, LOG, & Sustainment Apl
02	0602144A / DA1	SAFR Alternatives for Readiness Applied Research
02	0602145A / CU5	Platform Agnostic Armaments Applied Technology
02	0602146A / CU6	Adaptive Information Mediation and Analytics
02	0602146A / CV4	Pathfinder 3D Applied Technology
02	0602150A / CV7	High Energy Laser Direct Diode Apl Tech
02	0602150A / CV8	Vulnerability Modules for Multi-Domain Operations
02	0602150A / DA9	Radar Survivability through Dis Sensing Tech
02	0602180A / DA5	AI Enabled Talent Management Applied Research
02	0602180A / DA6	AI-Enabled Command and Coordination Apl Research
02	0602183A / CU7	Control & Autonomy for Tactical Superiority Tech
02	0602183A / CU8	Structures Tech for Enduring Efficient Resilience

02	0602183A / CU9	Systems Design Technology
02	0602184A / CV9	Technical-SAVVY Soldier Applied Research
03	0603025A / DA3	Army Advanced Innovation
03	0603040A / CN6	Predictive Maintenance Advanced Technology
03	0603040A / DA7	AI-Enabled Command and Coordination Adv Tech
03	0603041A / DA4	All Domain Convergence Engineering & Architectures
03	0603043A / CV1	Control & Autonomy for Tactical Superiority Adv
03	0603043A / CV2	Structures Platform Int Resilience & Efficiency
03	0603119A / CV5	Engineer Enablers Maneuver, LOG, & Sustainment Adv
03	0603119A / DA2	SAFR Alternatives for Readiness Advanced Tech
03	0603466A / CV6	Optimized High Energy Laser Source Adv Tech
03	0603466A / DB3	Radar Survivability through Dis Sensing Adv Tech
04	0604020A / DC8	Army Experimentation and Prototyping
05	0604641A / CF5	Robotic Combat Vehicle (BA5) NGCV-CFT
05	0604827A / S65	Platoon Power Generator
05	0604854A / 516	Paladin/FAASV
06	0605235A / CQ4	Mid-Range Capability

Program Element/Project Restructures:

<u>Budget Activity</u>	<u>Old OSDPE / Project: Title</u>	<u>New OSDPE / Project</u>
02	0602143A / BE6: Reactive/Resp Surfaces & Matls-Soldiers & Sys	0602184A / CW9
02	0602146A / A02: Stand-In Advanced RF Effects (STARE)	0602146A / AP5
02	0602146A / AR3: Intelligent Environmental Battlefield Awareness	0602182A / CX3
02	0602146A / AR7: Sensing in Contested Environments Technology	0602182A / CX5
02	0602146A / AR9: Persistent Geophysical Sensing-Infrasound Tech	0602182A / CX4
02	0602146A / AT2: Subterranean Detection and Monitoring Technology	0602182A / CX6
02	0602146A / AV7: Atmospheric Modeling and Meteorological Technology	0602182A / CW2
02	0602146A / CK1: Assured PNT Enabling Technologies	0602182A / CZ6
02	0602148A / AI9: Future UAS Engine Technology	0602183A / CW6

02	0602148A / AJ2: Next Generation Rotorcraft Transmission Technology	0602183A / CW8
02	0602148A / AJ6: Advanced Rotors Technology	0602183A / CW3
02	0602148A / AJ8: Experimental and Computational Aeromechanics Techn	0602183A / CW5
02	0602148A / AL2: High Performance Computing for Rotorcraft App Tech	0602183A / DC2
02	0602148A / AL4: High Speed and Efficient VTOL Vehicle Technology	0602183A / CW7
02	0602148A / AL5: Air Vehicle Structures and Dynamics Technology	0602183A / CW4
02	0602148A / AL8: Holistic Situational Awareness and Dec Making Tech	0602141A / CG4
02	0602150A / AD2: High Energy Laser (HEL) Enabling and Support Techn	0602150A / DC1
02	0602150A / AD3: Maneuver Air Defense Technology	0603466A / AD4
02	0602182A / CM9: Convergent CEMA Deception	0602182A / CZ7
03	0602145A / BJ9: Autonomous Mobility Tech	0603462A / BK1
03	0602146A / AM8: Protected SATCOM Technology	0603463A / AM9
03	0602148A / AK4: Multi-Role Small Guided Missile Technology	0603465A / AK5
03	0603463A / AR4: Intelligent Env Battlefield Awareness Adv Tech	0603042A / CX7
03	0603463A / AS9: Persistent Geophysical Sensing-Infrasound Adv Tech	0603042A / CX8
03	0603463A / AR8: Sensing in Contested Environments Adv Technology	0603042A / CX9
03	0603463A / AT3: Subterranean Detection and Monitoring Adv Technology	0603042A / CZ5
03	0603465A / AJ7: Advanced Rotors Advanced Technology	0603043A / CX1
03	0603043A / AJ3: Next Generation Rotorcraft Transmission Adv Technology	0603043A / CX2
03	0603043A / AL3: HPC for Rotorcraft Applications Adv Tech	0603043A / DC3
03	0603463A / AU2: Optimization of Geospatial Data for Visualization	0603463A / AT8
03	0603463A / AV1: GEOInt/Ops Logistics Integration-Planning Adv Tech	0603463A / AU4
03	0602147A / AF1: Long Range Maneuverable Fires (LRMF) Technology	0603464A / AF2
03	0603464A / AE8: Land-Based Anti-Ship Missile (LBASM) Advanced Tech	0603464A / CZ8
03	0603465A / CH6: Adapt & Resilnt Tach Autnmy Cont&Struct Adv Tech	0603043A / CV1
03	0603465A / CH6: Adapt & Resilnt Tach Autnmy Cont&Struct Adv Tech	0603043A / CV2
03	0603465A / CH8: UAS Survivability Advance Technology	0603465A / AK3
03	0603465A / CH8: UAS Survivability Advance Technology	0603465A / CG1
03	0602148A / BZ7: Future Vertical Lift Medical Technologies	0603465A / CJ5
04	0603466A / AD1: High Energy Laser Tactical Vehicle Demo Adv Tech	0604019A / BU9
04	0305251A / FA8: Cyberspace Operations Forces and Force Support	0305251A / DD3
04	0603801A / B47: Future Vertical Lift	0603801A / CS7
04	0604117A / FI4: Maneuver - Short Range Air Defense (M-SHORAD)	0604117A / CR9
04	0605054A / FI3: Rapid Capability Development and Maturation	0604117A / CR9
04	0604117A / FI4: Maneuver - Short Range Air Defense (M-SHORAD)	0604117A / CS1

04	0604644A / MR1: Mobile Intermediate Range Missile	0604135A / MR2
04	0604644A / MR1: Mobile Intermediate Range Missile	0604135A / MR3
04	0604644A / MR1: Mobile Intermediate Range Missile	0604135A / MR4
04	0604182A / HX1: Long Range Hypersonic Weapon	0604182A / HX3
04	0604182A / HX1: Long Range Hypersonic Weapon	0604182A / HX4
04	0604182A / HX1: Long Range Hypersonic Weapon	0604182A / HX5
04	0604182A / HX1: Long Range Hypersonic Weapon	0604182A / HX6
05	0604818A / EJ5: Mounted Computing Environment (MCE)	0604805A / 593
05	0605013A / T05: Army Business System Modernization Initiatives	0605013A / BY3
05	0608041A / CD1: Defensive Cyber - Software Prototype Devel	0605041A / XU3
05	0605042A / FA1: Manpack Radio	0605236A / CQ1
05	0605042A / FA2: Rifleman Radio (RR)	0605236A / CQ1
06	0605602A / 628: Developmental Test Technology & Sustainment	0605602A / FJ3
06	0605602A / 62C: Modeling and Simulation Instrumentation	0605602A / FJ3
07	0303142A / 456: MILSATCOM System Engineering	0303142A / CO7
07	0205778A / EG2: GMLRS Alternative Warheads	0205778A / EG3

Program Terminations (including transfers to Procurement and Sustainment):

<u>Budget Activity</u>	<u>OSDPE / Project</u>	<u>Project Title</u>
01	0601104A / CI9	University & Industry Rsch Ctrs / Strategic University Basic Research Alliance
02	0602141A / CJ6	Lethality Technology / Advanced Energetics for Missile Technologies
02	0602143A / BB9	Soldier Lethality Technology / Human Performance Tech for Mobility & Lethality
02	0602144A / CG5	Ground Technology / Ground Vehicle Sensor Concepts and Technologies
02	0602146A / AR1	Network C3I Technology / Robust, Resilient and Intelligent C3I Technology
02	0602150A / AD5	Air and Missile Defense Technology / Next Generation Fires Radar Technology
03	0603002A / MN3	Medical Advanced Technology / Immediate Cardiopulmonary Stabilization Adv Tech
03	0603002A / MN4	Medical Advanced Technology / Advanced Life Support Advanced Technology
03	0603002A / MN5	Medical Advanced Technology / Next Generation Blood Products Advanced Technology
03	0603002A / MN9	Medical Advanced Technology / Far Forward Behavioral Health Care Advanced Tech

03	0603463A / AN2	Network C3I Advanced Technology / Narrowband SATCOM Advanced Technology
03	0603466A / AD4	Air and Missile Defense Adv Technology / Maneuver Air Defense Advanced Technology
04	0604785A / DS4	Integrated Base Defense / Integrated Base Defense
05	0604854A / HB6	Artillery Systems EMD / Mobile 155MM Howitzer

3. **Classification:** This document contains no classified data. Appropriately cleared individuals can obtain further information on Classified/Special Access Programs by contacting the Department of the Army.

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

<u>Summary Recap of Budget Activities</u>	<u>FY 2021 (Base + OCO)</u>	<u>FY 2022 Enactment</u>	<u>FY 2023 Request</u>
Basic Research	552,521	606,509	466,823
Applied Research	1,518,220	1,529,888	883,759
Advanced Technology Development	1,948,792	2,190,430	1,392,065
Advanced Component Development & Prototypes	3,589,313	3,818,276	4,098,749
System Development & Demonstration	2,979,946	3,254,230	4,031,334
Management Support	1,832,049	1,553,905	1,554,252
Operational Systems Development	1,719,691	1,466,180	1,188,403
Software and Digital Technology Pilot Programs	56,706	108,841	94,888
Total Research, Development, Test & Evaluation	14,197,238	14,528,259	13,710,273
 <u>Summary Recap of FYDP Programs</u>			
General Purpose Forces	589,523	579,473	392,489
Intelligence and Communications	372,869	275,873	210,597
Research and Development	13,099,825	13,566,200	13,009,253
Central Supply and Maintenance	130,785	103,720	91,270
Administration and Associated Activities	253		
Classified Programs	3,983	2,993	6,664
Total Research, Development, Test & Evaluation	14,197,238	14,528,259	13,710,273

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Se c
1	0601102A	Defense Research Sciences	01	344,031	368,751	279,328	U
2	0601103A	University Research Initiatives	01	84,697	91,241	70,775	U
3	0601104A	University and Industry Research Centers	01	118,716	126,267	100,909	U
4	0601121A	Cyber Collaborative Research Alliance	01	5,077	5,067	5,355	U
5	0601601A	Artificial Intelligence and Machine Learning Basic Research	01		15,183	10,456	U
Basic Research				552,521	606,509	466,823	
6	0602002A	Army Agile Innovation and Development-Applied Research	02			9,534	U
7	0602115A	Biomedical Technology	02	11,403	11,925		U
8	0602134A	Counter Improvised-Threat Advanced Studies	02	1,927	1,976	6,192	U
9	0602141A	Lethality Technology	02	117,484	91,626	87,717	U
10	0602142A	Army Applied Research	02	29,257	28,654	27,833	U
11	0602143A	Soldier Lethality Technology	02	201,511	205,058	103,839	U
12	0602144A	Ground Technology	02	159,358	216,550	52,848	U
13	0602145A	Next Generation Combat Vehicle Technology	02	258,341	245,525	174,090	U
14	0602146A	Network C3I Technology	02	202,256	164,804	64,115	U
15	0602147A	Long Range Precision Fires Technology	02	119,007	93,785	43,029	U
16	0602148A	Future Verticle Lift Technology	02	169,536	133,158	69,348	U
17	0602150A	Air and Missile Defense Technology	02	107,584	93,549	27,016	U
18	0602180A	Artificial Intelligence and Machine Learning Technologies	02		15,034	16,454	U
19	0602181A	All Domain Convergence Applied Research	02		25,967	27,399	U
20	0602182A	C3I Applied Research	02		12,406	27,892	U
21	0602183A	Air Platform Applied Research	02		6,597	41,588	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
22	0602184A	Soldier Applied Research	02		11,064	15,716	U
23	0602213A	C3I Applied Cyber	02	18,816	12,119	13,605	U
24	0602386A	Biotechnology for Materials - Applied Research	02		20,643	21,919	U
25	0602785A	Manpower/Personnel/Training Technology	02	20,399	18,701	19,649	U
26	0602787A	Medical Technology	02	101,341	120,747	33,976	U
Applied Research				1,518,220	1,529,888	883,759	
27	0603002A	Medical Advanced Technology	03	95,146	137,804	5,207	U
28	0603007A	Manpower, Personnel and Training Advanced Technology	03	11,344	14,273	15,598	U
29	0603025A	Army Agile Innovation and Demonstration	03		22,231	20,900	U
30	0603040A	Artificial Intelligence and Machine Learning Advanced Technologies	03		909	6,395	U
31	0603041A	All Domain Convergence Advanced Technology	03		17,743	45,463	U
32	0603042A	C3I Advanced Technology	03		3,151	12,716	U
33	0603043A	Air Platform Advanced Technology	03		754	17,946	U
34	0603044A	Soldier Advanced Technology	03		890	479	U
35	0603115A	Medical Development	03	26,711	26,508		U
36	0603116A	Lethality Advanced Technology	03		8,066	9,796	U
37	0603117A	Army Advanced Technology Development	03	64,163	76,815	134,874	U
38	0603118A	Soldier Lethality Advanced Technology	03	154,161	152,369	100,935	U
39	0603119A	Ground Advanced Technology	03	196,055	280,490	32,546	U
40	0603134A	Counter Improvised-Threat Simulation	03	24,087	24,747	21,486	U
41	0603386A	Biotechnology for Materials - Advanced Research	03		53,736	56,853	U
42	0603457A	C3I Cyber Advanced Development	03	43,357	61,426	41,354	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
43	0603461A	High Performance Computing Modernization Program	03	221,161	229,123	251,964	U
44	0603462A	Next Generation Combat Vehicle Advanced Technology	03	309,860	299,712	193,242	U
45	0603463A	Network C3I Advanced Technology	03	215,337	211,068	125,565	U
46	0603464A	Long Range Precision Fires Advanced Technology	03	177,142	141,909	100,830	U
47	0603465A	Future Vertical Lift Advanced Technology	03	220,334	261,880	177,836	U
48	0603466A	Air and Missile Defense Advanced Technology	03	173,244	145,826	11,147	U
49	0603920A	Humanitarian Demining	03	16,690	19,000	8,933	U
Advanced Technology Development				1,948,792	2,190,430	1,392,065	
50	0603305A	Army Missile Defense Systems Integration	04	139,518	56,702	12,001	U
51	0603308A	Army Space Systems Integration	04	25,584	25,755	17,945	U
52	0603327A	Air and Missile Defense Systems Engineering	04	47,098	15,000		U
53	0603619A	Landmine Warfare and Barrier - Adv Dev	04	56,067	46,637	64,001	U
54	0603639A	Tank and Medium Caliber Ammunition	04	106,881	73,844	64,669	U
55	0603645A	Armored System Modernization - Adv Dev	04	130,485	164,328	49,944	U
56	0603747A	Soldier Support and Survivability	04	5,312	2,897	4,060	U
57	0603766A	Tactical Electronic Surveillance System - Adv Dev	04	182,400	113,365	72,314	U
58	0603774A	Night Vision Systems Advanced Development	04	15,179	62,820	18,048	U
59	0603779A	Environmental Quality Technology - Dem/Val	04	20,906	22,921	31,249	U
60	0603790A	NATO Research and Development	04	4,589	3,777	3,805	U
61	0603801A	Aviation - Adv Dev	04	694,296	1,178,460	1,162,344	U
62	0603804A	Logistics and Engineer Equipment - Adv Dev	04	15,287	11,055	9,638	U
63	0603807A	Medical Systems - Adv Dev	04	36,006	37,053	598	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Se c
64	0603827A	Soldier Systems - Advanced Development	04	23,905	25,925	25,971	U
65	0604017A	Robotics Development	04	92,401	80,525	26,594	U
66	0604019A	Expanded Mission Area Missile (EMAM)	04		27,872	220,820	U
67	0604020A	Cross Functional Team (CFT) Advanced Development & Prototyping	04			106,000	U
68	0604021A	Electronic Warfare Technology Maturation (MIP)	04	15,034			U
69	0604035A	Low Earth Orbit (LEO) Satellite Capability	04	21,850	19,638	35,509	U
70	0604036A	Multi-Domain Sensing System (MDSS) Adv Dev	04		50,548	49,932	U
71	0604037A	Tactical Intel Targeting Access Node (TITAN) Adv Dev	04		28,347	863	U
72	0604100A	Analysis Of Alternatives	04	9,714	10,091	10,659	U
73	0604101A	Small Unmanned Aerial Vehicle (SUAV) (6.4)	04	1,328	926	1,425	U
74	0604113A	Future Tactical Unmanned Aircraft System (FTUAS)	04	59,183	76,349	95,719	U
75	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor	04	308,805	297,629	382,147	U
76	0604115A	Technology Maturation Initiatives	04	141,109	132,561	269,756	U
77	0604117A	Maneuver - Short Range Air Defense (M-SHORAD)	04	5,776	39,376	225,147	U
78	0604119A	Army Advanced Component Development & Prototyping	04	167,990	189,483	198,111	U
79	0604120A	Assured Positioning, Navigation and Timing (PNT)	04	115,688	83,952	43,797	U
80	0604121A	Synthetic Training Environment Refinement & Prototyping	04	112,093	206,335	166,452	U
81	0604134A	Counter Improvised-Threat Demonstration, Prototype Development, and Testing	04	13,326	13,379	15,840	U
82	0604135A	Strategic Mid-Range Fires	04			404,291	U
83	0604182A	Hypersonics	04	841,666	315,131	173,168	U
84	0604403A	Future Interceptor	04		6,895	8,179	U
85	0604531A	Counter - Small Unmanned Aircraft Systems Advanced Development	04		19,148	35,110	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
86	0604541A	Unified Network Transport	04	39,192	35,172	36,966	U
87	0604644A	Mobile Medium Range Missile	04	88,100	286,445		U
88	0604785A	Integrated Base Defense (Budget Activity 4)	04	2,020	2,040		U
89	0305251A	Cyberspace Operations Forces and Force Support	04	50,525	55,895	55,677	U
Advanced Component Development & Prototypes				3,589,313	3,818,276	4,098,749	
90	0604201A	Aircraft Avionics	05	7,011	6,654	3,335	U
91	0604270A	Electronic Warfare Development	05	56,624	30,840	4,243	U
92	0604601A	Infantry Support Weapons	05	89,497	79,339	66,529	U
93	0604604A	Medium Tactical Vehicles	05	8,213	9,524	22,163	U
94	0604611A	JAVELIN	05	5,983	7,094	7,870	U
95	0604622A	Family of Heavy Tactical Vehicles	05	22,254	28,445	50,924	U
96	0604633A	Air Traffic Control	05	3,383	4,405	2,623	U
97	0604641A	Tactical Unmanned Ground Vehicle (TUGV)	05			115,986	U
98	0604642A	Light Tactical Wheeled Vehicles	05	4,371	2,055		U
99	0604645A	Armored Systems Modernization (ASM) - Eng Dev	05	123,992	122,778	71,287	U
100	0604710A	Night Vision Systems - Eng Dev	05	52,959	43,417	62,679	U
101	0604713A	Combat Feeding, Clothing, and Equipment	05	2,734	1,658	1,566	U
102	0604715A	Non-System Training Devices - Eng Dev	05	27,013	26,514	18,600	U
103	0604741A	Air Defense Command, Control and Intelligence - Eng Dev	05	62,058	59,518	39,541	U
104	0604742A	Constructive Simulation Systems Development	05	9,779	22,240	29,570	U
105	0604746A	Automatic Test Equipment Development	05	5,375	8,807	5,178	U
106	0604760A	Distributive Interactive Simulations (DIS) - Eng Dev	05	7,605	12,453	8,189	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
107	0604768A	Brilliant Anti-Armor Submunition (BAT)	05	20,175			U
108	0604780A	Combined Arms Tactical Trainer (CATT) Core	05	3,438			U
109	0604798A	Brigade Analysis, Integration and Evaluation	05	18,737	21,423	21,228	U
110	0604802A	Weapons and Munitions - Eng Dev	05	277,344	297,086	263,778	U
111	0604804A	Logistics and Engineer Equipment - Eng Dev	05	53,676	54,642	41,669	U
112	0604805A	Command, Control, Communications Systems - Eng Dev	05	10,674	20,107	40,038	U
113	0604807A	Medical Materiel/Medical Biological Defense Equipment - Eng Dev	05	48,285	44,400	5,513	U
114	0604808A	Landmine Warfare/Barrier - Eng Dev	05	9,239	29,137	12,150	U
115	0604818A	Army Tactical Command & Control Hardware & Software	05	126,676	155,017	111,690	U
116	0604820A	Radar Development	05	105,271	122,607	71,259	U
117	0604822A	General Fund Enterprise Business System (GFEBs)	05	15,428	15,979	10,402	U
118	0604823A	Firefinder	05	18,278			U
119	0604827A	Soldier Systems - Warrior Dem/Val	05	6,546	6,454	11,425	U
120	0604852A	Suite of Survivability Enhancement Systems - EMD	05	62,012	96,132	109,702	U
121	0604854A	Artillery Systems - EMD	05	36,187	25,000	23,106	U
122	0605013A	Information Technology Development	05	123,659	129,380	124,475	U
123	0605018A	Integrated Personnel and Pay System-Army (IPPS-A)	05	111,078	67,701	67,564	U
124	0605028A	Armored Multi-Purpose Vehicle (AMPV)	05	76,140	35,560		U
125	0605030A	Joint Tactical Network Center (JTNC)	05	15,671	16,350	17,950	U
126	0605031A	Joint Tactical Network (JTN)	05	30,540	28,905	30,169	U
127	0605033A	Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)	05	5,758			U
128	0605035A	Common Infrared Countermeasures (CIRCM)	05	29,770	16,630	11,523	U

Page A-7

UNCLASSIFIED

Volume 1c - xiv

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
129	0605038A	Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) Sensor Suite	05	4,669	7,618		U
130	0605041A	Defensive CYBER Tool Development	05	28,544	18,811	33,029	U
131	0605042A	Tactical Network Radio Systems (Low-Tier)	05	20,511	28,741	4,497	U
132	0605047A	Contract Writing System	05	22,025	20,960	23,487	U
133	0605051A	Aircraft Survivability Development	05	99,403	61,768	19,123	U
134	0605052A	Indirect Fire Protection Capability Inc 2 - Block 1	05	152,399	182,257	131,093	U
135	0605053A	Ground Robotics	05	12,010	16,360	26,809	U
136	0605054A	Emerging Technology Initiatives	05	294,366	226,802	185,311	U
137	0605143A	Biometrics Enabling Capability (BEC)	05		4,326	11,091	U
138	0605144A	Next Generation Load Device - Medium	05		15,397	22,439	U
139	0605145A	Medical Products and Support Systems Development	05	919	962		U
140	0605148A	Tactical Intel Targeting Access Node (TITAN) EMD	05		54,972	58,087	U
141	0605203A	Army System Development & Demonstration	05	177,501	122,175	119,516	U
142	0605205A	Small Unmanned Aerial Vehicle (SUAV) (6.5)	05	5,780	2,275	6,530	U
143	0605224A	Multi-Domain Intelligence	05		9,313	19,911	U
144	0605225A	SIO Capability Development	05		22,713		U
145	0605231A	Precision Strike Missile (PrSM)	05		188,452	259,506	U
146	0605232A	Hypersonics EMD	05		111,473	633,499	U
147	0605233A	Accessions Information Environment (AIE)	05		16,790	13,647	U
148	0605235A	Strategic Mid-Range Capability	05			5,016	U
149	0605236A	Integrated Tactical Communications	05			12,447	U
150	0605450A	Joint Air-to-Ground Missile (JAGM)	05	7,566	2,134	2,366	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Se
151	0605457A	Army Integrated Air and Missile Defense (AIAMD)	05	213,956	159,873	265,288	U
152	0605531A	Counter - Small Unmanned Aircraft Systems Sys Dev & Demonstration	05		33,386	14,892	U
153	0605625A	Manned Ground Vehicle	05	162,390	202,320	589,762	U
154	0605766A	National Capabilities Integration (MIP)	05	7,670	13,454	17,030	U
155	0605812A	Joint Light Tactical Vehicle (JLTV) Engineering and Manufacturing Development Ph	05	1,500	2,564	9,376	U
156	0605830A	Aviation Ground Support Equipment	05	1,413	1,201	2,959	U
157	0303032A	TROJAN - RH12	05	3,451	3,362	3,761	U
158	0303667A	Citizen Broadband Radio System	05	900			U
159	0303767A	AMBIT - Pre-Auctioned SRF	05	9,785			U
160	0304270A	Electronic Warfare Development	05	59,755	75,520	56,938	U
System Development & Demonstration				2,979,946	3,254,230	4,031,334	
161	0604256A	Threat Simulator Development	06	41,487	61,422	18,437	U
162	0604258A	Target Systems Development	06	35,279	42,404	19,132	U
163	0604759A	Major T&E Investment	06	119,231	93,617	107,706	U
164	0605103A	Rand Arroyo Center	06	12,989	32,296	35,542	U
165	0605301A	Army Kwajalein Atoll	06	221,949	240,877	309,005	U
166	0605326A	Concepts Experimentation Program	06	46,847	79,585	87,122	U
167	0605502A	Small Business Innovative Research	06	369,715			U
168	0605601A	Army Test Ranges and Facilities	06	390,366	367,125	401,643	U
169	0605602A	Army Technical Test Instrumentation and Targets	06	81,829	59,253	37,962	U
170	0605604A	Survivability/Lethality Analysis	06	36,001	36,370	36,500	U
171	0605606A	Aircraft Certification	06	2,736	2,489	2,777	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Se c
172	0605702A	Meteorological Support to RDT&E Activities	06	6,360	6,521	6,958	U
173	0605706A	Materiel Systems Analysis	06	21,830	21,558	22,037	U
174	0605709A	Exploitation of Foreign Items	06	8,936	13,631	6,186	U
175	0605712A	Support of Operational Testing	06	54,116	55,122	70,718	U
176	0605716A	Army Evaluation Center	06	56,827	65,854	67,058	U
177	0605718A	Army Modeling & Sim X-Cmd Collaboration & Integ	06	2,478	2,633	6,097	U
178	0605801A	Programwide Activities	06	89,023	96,558	89,793	U
179	0605803A	Technical Information Activities	06	25,817	31,987	28,752	U
180	0605805A	Munitions Standardization, Effectiveness and Safety	06	50,648	63,042	48,316	U
181	0605857A	Environmental Quality Technology Mgmt Support	06	1,715	1,789	1,912	U
182	0605898A	Army Direct Report Headquarters - R&D - MHA	06	50,859	48,981	53,271	U
183	0606002A	Ronald Reagan Ballistic Missile Defense Test Site	06	74,089	80,921	90,088	U
184	0606003A	CounterIntel and Human Intel Modernization	06	5,200	5,363	1,424	U
185	0606105A	Medical Program-Wide Activities	06	18,973	39,041		U
186	0606942A	Assessments and Evaluations Cyber Vulnerabilities	06	6,496	5,466	5,816	U
187	0909999A	Financing for Cancelled Account Adjustments	06	253			U
		Management Support		1,832,049	1,553,905	1,554,252	
188	0603778A	MLRS Product Improvement Program	07	9,785	12,314	18,463	U
189	0605024A	Anti-Tamper Technology Support	07	8,436	8,868	9,284	U
190	0607131A	Weapons and Munitions Product Improvement Programs	07	24,666	35,828	11,674	U
191	0607134A	Long Range Precision Fires (LRPF)	07	100,146			U
192	0607136A	Blackhawk Product Improvement Program	07	8,300	14,773		U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Se c
193	0607137A	Chinook Product Improvement Program	07	49,409	67,872	52,513	U
194	0607139A	Improved Turbine Engine Program	07	232,159	260,024	228,036	U
195	0607142A	Aviation Rocket System Product Improvement and Development	07	11,321	12,417	11,312	U
196	0607143A	Unmanned Aircraft System Universal Products	07	19,460	4,594	512	U
197	0607145A	Apache Future Development	07	52,502	10,067	10,074	U
198	0607148A	AN/TPQ-53 Counterfire Target Acquisition Radar System	07		47,752	62,559	U
199	0607150A	Intel Cyber Development	07	14,652	3,611	13,343	U
200	0607312A	Army Operational Systems Development	07	35,851	28,029	26,131	U
201	0607313A	Electronic Warfare Development	07		5,673	6,432	U
202	0607665A	Family of Biometrics	07	1,276	1,144	1,114	U
203	0607865A	Patriot Product Improvement	07	178,984	125,932	152,312	U
204	0203728A	Joint Automated Deep Operation Coordination System (JADOCS)	07	43,060	25,489	19,329	U
205	0203735A	Combat Vehicle Improvement Programs	07	213,726	280,107	192,310	U
206	0203743A	155mm Self-Propelled Howitzer Improvements	07	217,959	175,076	136,680	U
207	0203744A	Aircraft Modifications/Product Improvement Programs	07	11,261	10,000		U
208	0203752A	Aircraft Engine Component Improvement Program	07	80	132	148	U
209	0203758A	Digitization	07	4,351	3,903	2,100	U
210	0203801A	Missile/Air Defense Product Improvement Program	07	1,241	127	3,109	U
211	0203802A	Other Missile Product Improvement Programs	07	15,268	10,265	9,027	U
212	0205412A	Environmental Quality Technology - Operational System Dev	07	250	262	793	U
213	0205778A	Guided Multiple-Launch Rocket System (GMLRS)	07	72,817	60,733	20,180	U
214	0208053A	Joint Tactical Ground System	07	9,510	13,379	8,813	U

UNCLASSIFIED

Department of the Army
 FY 2023 President's Budget
 Exhibit R-1 FY 2023 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

Apr 2022

Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2021 (Base + OCO)	FY 2022 Enactment	FY 2023 Request	Sec
216	0303028A	Security and Intelligence Activities	07	23,367	24,531		U
217	0303140A	Information Systems Security Program	07	28,270	15,680	17,209	U
218	0303141A	Global Combat Support System	07	70,652	45,297	27,100	U
219	0303142A	SATCOM Ground Environment (SPACE)	07	18,002	15,222	18,321	U
222	0305179A	Integrated Broadcast Service (IBS)	07	382	5,430	9,926	U
223	0305204A	Tactical Unmanned Aerial Vehicles	07	38,151	8,410	4,500	U
224	0305206A	Airborne Reconnaissance Systems	07	28,858	24,460	17,165	U
225	0305208A	Distributed Common Ground/Surface Systems	07	40,771			U
226	0307665A	Biometrics Enabled Intelligence	07		2,066		U
227	0708045A	End Item Industrial Preparedness Activities	07	130,785	103,720	91,270	U
9999	9999999999	Classified Programs		3,983	2,993	6,664	U
		Operational Systems Development		1,719,691	1,466,180	1,188,403	
228	0608041A	Defensive CYBER - Software Prototype Development	08	56,706	108,841	94,888	U
		Software and Digital Technology Pilot Programs		56,706	108,841	94,888	
Total Research, Development, Test & Eval, Army				14,197,238	14,528,259	13,710,273	

UNCLASSIFIED

Army • Budget Estimates FY 2023 • RDT&E Program

Program Element Table of Contents (by Budget Activity then Line Item Number)

Appropriation 2040: Research, Development, Test & Evaluation, Army

Line #	Budget Activity	Program Element Number	Program Element Title	Page
27	03	0603002A	Medical Advanced Technology.....	Volume 1c - 1
28	03	0603007A	Manpower, Personnel and Training Advanced Technology.....	Volume 1c - 40
29	03	0603025A	Army Agile Innovation and Demonstration.....	Volume 1c - 44
30	03	0603040A	Artificial Intelligence and Machine Learning Advanced Technologies.....	Volume 1c - 52
31	03	0603041A	All Domain Convergence Advanced Technology.....	Volume 1c - 62
32	03	0603042A	C3I Advanced Technology.....	Volume 1c - 75
33	03	0603043A	Air Platform Advanced Technology.....	Volume 1c - 89
34	03	0603044A	Soldier Advanced Technology.....	Volume 1c - 104
35	03	0603115A	Medical Development.....	Volume 1c - 109
36	03	0603116A	Lethality Advanced Technology.....	Volume 1c - 117
37	03	0603117A	Army Advanced Technology Development.....	Volume 1c - 125
38	03	0603118A	Soldier Lethality Advanced Technology.....	Volume 1c - 126
39	03	0603119A	Ground Advanced Technology.....	Volume 1c - 171
40	03	0603134A	Counter Improvised-Threat Simulation.....	Volume 1c - 207
41	03	0603386A	Biotechnology for Materials - Advanced Research.....	Volume 1c - 211
42	03	0603457A	C3I Cyber Advanced Development.....	Volume 1c - 215

UNCLASSIFIED

UNCLASSIFIED

Army • Budget Estimates FY 2023 • RDT&E Program

Appropriation 2040: Research, Development, Test & Evaluation, Army

Line #	Budget Activity	Program Element Number	Program Element Title	Page
43	03	0603461A	High Performance Computing Modernization Program.....	Volume 1c - 228
44	03	0603462A	Next Generation Combat Vehicle Advanced Technology.....	Volume 1c - 237
45	03	0603463A	Network C3I Advanced Technology.....	Volume 1c - 299
46	03	0603464A	Long Range Precision Fires Advanced Technology.....	Volume 1c - 380
47	03	0603465A	Future Vertical Lift Advanced Technology.....	Volume 1c - 400
48	03	0603466A	Air and Missile Defense Advanced Technology.....	Volume 1c - 455
49	03	0603920A	Humanitarian Demining.....	Volume 1c - 477

UNCLASSIFIED

UNCLASSIFIED

Army • Budget Estimates FY 2023 • RDT&E Program

Program Element Table of Contents (Alphabetically by Program Element Title)

Program Element Title	Program Element Number	Line #	BA	Page
Air Platform Advanced Technology	0603043A	33	03.....	Volume 1c - 89
Air and Missile Defense Advanced Technology	0603466A	48	03.....	Volume 1c - 455
All Domain Convergence Advanced Technology	0603041A	31	03.....	Volume 1c - 62
Army Advanced Technology Development	0603117A	37	03.....	Volume 1c - 125
Army Agile Innovation and Demonstration	0603025A	29	03.....	Volume 1c - 44
Artificial Intelligence and Machine Learning Advanced Technologies	0603040A	30	03.....	Volume 1c - 52
Biotechnology for Materials - Advanced Research	0603386A	41	03.....	Volume 1c - 211
C3I Advanced Technology	0603042A	32	03.....	Volume 1c - 75
C3I Cyber Advanced Development	0603457A	42	03.....	Volume 1c - 215
Counter Improvised-Threat Simulation	0603134A	40	03.....	Volume 1c - 207
Future Vertical Lift Advanced Technology	0603465A	47	03.....	Volume 1c - 400
Ground Advanced Technology	0603119A	39	03.....	Volume 1c - 171
High Performance Computing Modernization Program	0603461A	43	03.....	Volume 1c - 228
Humanitarian Demining	0603920A	49	03.....	Volume 1c - 477
Lethality Advanced Technology	0603116A	36	03.....	Volume 1c - 117
Long Range Precision Fires Advanced Technology	0603464A	46	03.....	Volume 1c - 380
Manpower, Personnel and Training Advanced Technology	0603007A	28	03.....	Volume 1c - 40

UNCLASSIFIED

UNCLASSIFIED

Army • Budget Estimates FY 2023 • RDT&E Program

Program Element Title	Program Element Number	Line #	BA	Page
Medical Advanced Technology	0603002A	27	03.....	Volume 1c - 1
Medical Development	0603115A	35	03.....	Volume 1c - 109
Network C3I Advanced Technology	0603463A	45	03.....	Volume 1c - 299
Next Generation Combat Vehicle Advanced Technology	0603462A	44	03.....	Volume 1c - 237
Soldier Advanced Technology	0603044A	34	03.....	Volume 1c - 104
Soldier Lethality Advanced Technology	0603118A	38	03.....	Volume 1c - 126

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology
--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	95.146	137.804	5.207	-	5.207	4.129	3.088	2.029	2.028	0.000	249.431
814: NEUROFIBROMATOSIS (CA)	-	20.000	-	-	-	-	-	-	-	-	0.000	20.000
945: BREAST CANCER STAMP PROCEEDS	-	0.477	-	-	-	-	-	-	-	-	0.000	0.477
97T: NEUROTOXIN EXPOSURE TREATMENT (CA)	-	16.000	-	-	-	-	-	-	-	-	0.000	16.000
CJ3: Prophylactic for Endemic Diarrheal Diseases	-	-	4.009	-	-	-	-	-	-	-	0.000	4.009
MM2: MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)	-	21.000	94.000	-	-	-	-	-	-	-	0.000	115.000
MM7: Enabling Med Cap to Support Dispersed OPS Adv Tech	-	2.913	3.232	0.749	-	0.749	0.852	1.030	1.030	1.030	0.000	10.836
MN3: Immediate Cardiopulmonary Stabilization Adv Tech	-	2.071	1.727	-	-	-	-	-	-	-	0.000	3.798
MN4: Advanced Life Support Advanced Technology	-	3.615	3.927	-	-	-	-	-	-	-	0.000	7.542
MN5: Next Generation Blood Products Advanced Technology	-	6.610	9.394	-	-	-	-	-	-	-	0.000	16.004
MN6: Blast & Head Impact Exposure Monitor Advanced Tech	-	1.878	1.546	1.168	-	1.168	-	-	-	-	0.000	4.592
MN7: Musculoskeletal Injury Screening Tool Adv Tech	-	3.274	1.664	1.276	-	1.276	0.759	0.822	0.481	0.481	0.000	8.757
MN9: Far Forward Behavioral Health Care Advanced Tech	-	1.080	0.283	-	-	-	-	-	-	-	0.000	1.363

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology							
MO2: Traumatic Brain Injury (TBI) Treatment Adv Tech	-	4.649	10.667	-	-	-	-	-	-	-	0.000	15.316
MO4: Burn Recovery Optimization Advanced Technology	-	3.326	2.059	-	-	-	-	-	-	-	0.000	5.385
MO7: Improved Bone Repair Advanced Technology	-	1.564	1.069	-	-	-	-	-	-	-	0.000	2.633
MO8: Expeditionary Performance Nutrition Advanced Techn	-	2.062	1.936	0.175	-	0.175	0.728	0.163	0.163	0.163	0.000	5.390
MO9: Vaccines to Prevent Dengue Fever Advanced Tech	-	2.037	-	-	-	-	-	-	-	-	0.000	2.037
MP3: Phys Chem Toxicity Assessment Sys Adv Tech	-	2.590	2.291	1.839	-	1.839	1.790	1.073	0.355	0.354	0.000	10.292

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates advanced medical technologies including drugs, vaccines, medical diagnostic devices, measures for identification and vector control, and developing medical practices and procedures to effectively protect and improve the survivability of United States Forces across the entire spectrum of military operations. Tri-Service coordination and cooperative efforts are focused in four principal medical areas: Combat Casualty Care, Military Operational Medicine, Militarily Relevant Infectious Diseases, and Clinical and Rehabilitative Medicine. Starting in Fiscal Year 2020 (FY20), the principal area of Clinical and Rehabilitative Medicine is replaced with the area of Medical Assist Support Technologies.

Promising medical technologies are refined and validated through extensive testing, which is conducted in compliance with Food and Drug Administration (FDA) regulations for human medical products, and environmental protection agency (EPA) regulations for insect-control products that impact humans or the environment (e.g., repellents and insecticides). The FDA requires medical products to undergo extensive preclinical testing in animals and/or other models to obtain preliminary effectiveness and safety information before they can be tested in human clinical trials. Clinical trials are conducted stepwise: first to prove the product is safe in humans, second to demonstrate the desired effectiveness and optimal dosage (amount to be administered) in a small group human study, and third to demonstrate effectiveness in large, diverse human populations. Each successive phase includes larger numbers of human subjects and requires FDA cognizance prior to proceeding. Work conducted in this PE primarily focuses on late stages of technology maturation activities required to conduct safety and effectiveness clinical trials. Some high-risk technologies may require additional maturation with FDA guidance prior to initiating these clinical trials. Such things as proof of product stability and purity are necessary to meet FDA standards before entering later stages of testing and prior to transitioning into a formal acquisition program where large pivotal trials in diverse populations will be conducted for licensure. Activities in this PE may include completion of preclinical animal studies and small safety and effectiveness studies involving humans according to FDA and EPA requirements. Promising medical technologies that are not regulated by the FDA or EPA are modeled, prototyped, and tested in relevant environments.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>
---	--

Blast research and research into maturing field rations in this PE are fully coordinated with the United States Army Combat Capabilities Development Command Soldier Center. This coordination enables improved body armor design and rations for Soldiers. Additionally, the activities funded in this PE are externally peer reviewed and fully coordinated with all Services as well as other agencies through the Joint Technology Coordinating Groups of the Armed Services Biomedical Research Evaluation and Management (ASBREM) Community of Interest (COI). The ASBREM COI, formed under the authority of the Assistant Secretary of Defense for Research and Engineering, serves to facilitate coordination and prevent unnecessary duplication of effort within the Department of Defense's biomedical research and development community, as well as its associated enabling research areas.

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) Science and Technology (S&T) focus areas and the Army Modernization Strategy.

Work in this PE is performed by: the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	94.669	43.804	0.000	-	0.000
Current President's Budget	95.146	137.804	5.207	-	5.207
Total Adjustments	0.477	94.000	5.207	-	5.207
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	94.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.477	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	5.207	-	5.207

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

Project: 814: NEUROFIBROMATOSIS (CA)

Congressional Add: *Peer-reviewed Neurofibromatosis Research*

Congressional Add Subtotals for Project: 814

Project: 97T: NEUROTOXIN EXPOSURE TREATMENT (CA)

Congressional Add: *Peer-reviewed Neurotoxin Exposure Treatment Parkinson's Research*

Congressional Add Subtotals for Project: 97T

	FY 2021	FY 2022
	20.000	-
Congressional Add Subtotals for Project: 814	20.000	-
	16.000	-
Congressional Add Subtotals for Project: 97T	16.000	-

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>
---	--

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

Project: MM2: *MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)*

Congressional Add: *Program Increase: Burn Care Training Curriculum*

Congressional Add: *Program Increase - Peer-Reviewed Military Burn Research*

Congressional Add: *Program Increase: Advanced Hemostat Products*

Congressional Add: *Aerial Reconfigurable Embedded System*

Congressional Add: *Dengue Vaccine Development*

Congressional Add: *Hearing Protection for Communications*

Congressional Add: *Heat Stress on Female Service Members*

Congressional Add: *Optimizing Military Health and Performance*

Congressional Add: *Peer-Reviewed Neurofibromatosis Research*

Congressional Add: *Peer-Reviewed Parkinson's Research*

Congressional Add: *Rapid Vaccine Development*

Congressional Add: *Suicide Prevention with Focus on Rural, Remote, Isolated, and OCONUS Installations*

Congressional Add: *Trauma Immunology Research*

Congressional Add Subtotals for Project: MM2

Congressional Add Totals for all Projects

	FY 2021	FY 2022
	5.000	5.000
	10.000	10.000
	6.000	-
	-	5.000
	-	6.000
	-	5.000
	-	2.000
	-	7.000
	-	20.000
	-	16.000
	-	10.000
	-	3.000
	-	5.000
	21.000	94.000
	57.000	94.000

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology	Project (Number/Name) 814 / NEUROFIBROMATOSIS (CA)
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
814: NEUROFIBROMATOSIS (CA)	-	20.000	-	-	-	-	-	-	-	-	0.000	20.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional increase for Neurofibromatosis Research Program.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Neurofibromatosis research.

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 2021	FY 2022
Congressional Add: Peer-reviewed Neurofibromatosis Research	20.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Neurofibromatosis.		
Work executed by Army Futures Command.		
Congressional Adds Subtotals	20.000	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology	Project (Number/Name) 945 / BREAST CANCER STAMP PROCEEDS
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
945: BREAST CANCER STAMP PROCEEDS	-	0.477	-	-	-	-	-	-	-	-	0.000	0.477
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
This Project receives funds as proceeds from the sale of Breast Cancer Stamps.

A. Mission Description and Budget Item Justification
This Project receives funds as proceeds from the sale of Breast Cancer Stamps.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Title: Breast Cancer Stamp Proceeds	0.477	-	-
Description: This Project receives funds as proceeds from the sale of Breast Cancer Stamps.			
Accomplishments/Planned Programs Subtotals	0.477	-	-

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology	Project (Number/Name) 97T / NEUROTOXIN EXPOSURE TREATMENT (CA)
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
97T: NEUROTOXIN EXPOSURE TREATMENT (CA)	-	16.000	-	-	-	-	-	-	-	-	0.000	16.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional increase for Peer-Reviewed Neurotoxin Exposure Treatment Parkinson's Research Program.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Neurotoxin Exposure Treatment.

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 2021	FY 2022
Congressional Add: Peer-reviewed Neurotoxin Exposure Treatment Parkinson's Research	16.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Neurotoxin Exposure Treatment Parkinson's Research.		
Work executed by Army Futures Command.		
Congressional Adds Subtotals	16.000	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology			Project (Number/Name) CJ3 / Prophylactic for Endemic Diarrheal Diseases				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CJ3: Prophylactic for Endemic Diarrheal Diseases	-	-	4.009	-	-	-	-	-	-	-	0.000	4.009
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), funding and mission in this project are realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.

A. Mission Description and Budget Item Justification

Demonstrate bacterial diarrheal prophylactic candidate safety, effectiveness, and pharmacokinetics through clinical trials in humans. Transition the prophylactic candidate to product developer in support of future FDA licensure.

Research is conducted in compliance with the United States Food and Drug Administration (FDA) regulations for medical products for human use.

Research is managed by the United States Army Medical Research and Development Command (USAMRDC) in coordination with the Naval Medical Research Center (NMRC). The Army is responsible for programming and funding all Department of Defense (DoD) naturally occurring infectious disease research requirements, thereby precluding duplication of effort within the Military Departments.

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the USAMRDC, Fort Detrick, MD.

Efforts in this Project support the Soldier portfolio and the principal area of Military Relevant Infectious Diseases.

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

	FY 2021	FY 2022	FY 2023
Title: Prophylactic for Endemic Diarrheal Diseases	-	3.863	-
Description: Demonstrate bacterial diarrheal prophylactic candidate safety, effectiveness, and pharmacokinetics through clinical trials in humans in support of future FDA licensure.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) CJ3 / <i>Prophylactic for Endemic Diarrheal Diseases</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature oral prophylactic candidates for the prevention of bacterial diarrheal diseases; validate commercial off the shelf (COTS) products for prevention of bacterial diarrheal diseases; provide data packages for the FDA to test suitable candidates in humans for safety and effectiveness; demonstrate the candidates in human clinical trials for safety and effectiveness against bacterial diarrheal diseases.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.</p>		-	0.146	-
Accomplishments/Planned Programs Subtotals		-	4.009	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>				Project (Number/Name) MM2 / <i>MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MM2: <i>MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)</i>	-	21.000	94.000	-	-	-	-	-	-	-	0.000	115.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional increase for Peer-reviewed military burn research.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Medical Advanced Technology Initiatives.

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 2021	FY 2022
Congressional Add: Program Increase: Burn Care Training Curriculum	5.000	5.000
FY 2021 Accomplishments: Program Increase supported advanced research on Burn Care Training Curriculum. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Burn Care Training Curriculum		
Congressional Add: Program Increase - Peer-Reviewed Military Burn Research	10.000	10.000
FY 2021 Accomplishments: Program Increase supported advanced research on Peer-reviewed Military Burn Research. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Peer-Reviewed Military Burn Research		
Congressional Add: Program Increase: Advanced Hemostat Products	6.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Advanced Hemostat Products.		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MM2 / <i>MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
<i>Congressional Add:</i> Aerial Reconfigurable Embedded System	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Aerial Reconfigurable Embedded System		
<i>Congressional Add:</i> Dengue Vaccine Development	-	6.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Dengue Vaccine Development		
<i>Congressional Add:</i> Hearing Protection for Communications	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Hearing Protection for Communications		
<i>Congressional Add:</i> Heat Stress on Female Service Members	-	2.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Heat Stress on Female Service Members		
<i>Congressional Add:</i> Optimizing Military Health and Performance	-	7.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Optimizing Military Health and Performance		
<i>Congressional Add:</i> Peer-Reviewed Neurofibromatosis Research	-	20.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Peer-Reviewed Neurofibromatosis Research		
<i>Congressional Add:</i> Peer-Reviewed Parkinson's Research	-	16.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Peer-Reviewed Parkinson's Research		
<i>Congressional Add:</i> Rapid Vaccine Development	-	10.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Rapid Vaccine Development		
<i>Congressional Add:</i> Suicide Prevention with Focus on Rural, Remote, Isolated, and OCONUS Installations	-	3.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Suicide Prevention with Focus on Rural, Remote, Isolated, and OCONUS Installations		
<i>Congressional Add:</i> Trauma Immunology Research	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Trauma Immunology Research		
Congressional Adds Subtotals	21.000	94.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MM2 / <i>MEDICAL ADVANCE TECHNOLOGY INITIATIVES (CA)</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology				Project (Number/Name) MM7 / Enabling Med Cap to Support Dispersed OPS Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MM7: <i>Enabling Med Cap to Support Dispersed OPS Adv Tech</i>	-	2.913	3.232	0.749	-	0.749	0.852	1.030	1.030	1.030	0.000	10.836
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Matures and demonstrates a tele-monitored and remote-controlled Combat Evacuation Mission Module to support medical resupply and casualty evacuation using future multi-purpose Vertical Take-Off and Landing (VTOL) unmanned aircraft systems (UAS). Provides a self-contained medical module capability adaptable to various future multi-purpose VTOL UAS. Matures and demonstrates an intelligent decision-support capability that can be operated on an Army or Navy provided End User Device (EUD), such as the NETT Warrior system, to assist medics with patient assessment, triage, treatment, and disposition in a Prolonged Field Care (PFC) environment by assessing patient conditions to provide adaptive care guidelines.

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

	FY 2021	FY 2022	FY 2023
Title: Medical Robotic and Autonomous Systems	2.913	-	-
Description: This Task now incorporates the previous Combat Evacuation Mission Module Task. Research, design and develop a tele-monitored and remote-controlled Combat Evacuation Mission Module to support medical resupply and casualty evacuation using future multi-purpose VTOL UAS. Provides a self-contained medical module capability adaptable to various future multi-purpose VTOL UAS. Research, design, and prototype an intelligent decision-support capability that can be operated on an Army or Navy provided End User Device (EUD), such as the NETT Warrior system, to assist medics with patient assessment, triage, treatment, and disposition in a PFC environment by assessing patient conditions to provide adaptive care guidelines.			
Title: Develop Prototype Medical Robotic and Autonomous System (Med-RAS)	-	3.120	0.749
Description: Matures and demonstrates a tele-monitored and remote-controlled Combat Evacuation Mission Module to support medical resupply and casualty evacuation using future multi-purpose VTOL UAS. Provides a self-contained medical module capability adaptable to various future multi-purpose VTOL UAS. Matures and demonstrates an intelligent decision-support capability that can be operated on an Army or Navy provided EUD, such as the NETT Warrior system, to assist medics with patient assessment, triage, treatment, and disposition in a PFC environment by assessing patient conditions to provide adaptive care guidelines.			
FY 2022 Plans: Will mature a self-contained Semi-Autonomous Casualty Management Module (SACM2) for integration of medical capability components to move from human to semi-autonomous, and fully automate interfaces for both tele-operated and closed-loop			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MM7 / <i>Enabling Med Cap to Support Dispersed OPS Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>controlled remote patient monitoring and management systems and in-flight interventions; provide communication infrastructure and cyber security solutions for remote patient monitoring, remote supervision and control of semi-autonomous patient management systems, and Virtual Health support for attending medics; demonstrate a Safe Transport and Evacuation Protocol System (STEPS) to implement the flight control constraints necessary to ensure patient safety and protect sensitive medical materiel during flight onboard unmanned or ?optionally-piloted? vehicles; optimize a Multi-Mission Vehicle Interface which includes an innovative patient handling system and a common vehicle interface (physical, electrical, and data links), providing a means to rapidly reconfigure future vehicle platforms for MEDEVAC or CASEVAC missions; mature a hardware system to enable video and audio data collection for integrating Computer Vision and Natural Language Processing technologies to automate documentation of patient encounter and medic interventions.</p> <p>FY 2023 Plans: Mature the combat evacuation mission module (CEMM) and conceptual designs and physical prototypes of the Multi-Mission Vehicle Interface (MMVI); demonstration the MMVI prototype with the Future Vertical Lift prototype or technology demonstrator vehicle or an ?optionally-manned? aircraft and /or Squad Multi-purpose Equipment Transport unmanned ground vehicle.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased due to realignment of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0602115DHA, Project Code 372G.</p>				
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.</p>		-	0.112	-
Accomplishments/Planned Programs Subtotals		2.913	3.232	0.749
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN3 / <i>Immediate Cardiopulmonary Stabilization Adv Tech</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN3: <i>Immediate Cardiopulmonary Stabilization Adv Tech</i>	-	2.071	1.727	-	-	-	-	-	-	-	0.000	3.798
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is Eliminated.

A. Mission Description and Budget Item Justification

This Project covers development, pre-clinical and early-clinical demonstration, and transition of technologies for immediate pre-hospital hemorrhage detection and control and airway management. These technologies facilitate autonomous intubation and airway management in combat casualties with obstructed airways. This Project also demonstrates advanced technologies for use in forward areas to detect and control non-compressible internal bleeding, and demonstration of pain-relieving drugs that are safe for use during bleeding.

Promising efforts identified through Applied Research conducted under Program Element (PE) 0602787A (Medical Technology) / Project MM4 (Cbt Casualty Care Applied Rsch Technology) are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development) / Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Immediate Cardiopulmonary Stabilization Advanced Technology	2.071	-	-
Description: Development, preclinical and early-clinical demonstration, and transition of technologies that facilitate autonomous intubation and airway management in combat casualties with obstructed airways, as well as advanced hemostatic bandage candidates that augment the patient's blood clotting system and new tourniquet technologies suitable for prolonged use.			
Title: Tactical Combat Casualty Care Pharmaceuticals and Devices Cap Set 1	-	1.702	-
Description: Development, late-phase animal studies and early-clinical demonstration, and transition of technologies that facilitate autonomous intubation and airway management in combat casualties with obstructed airways, as well as advanced			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN3 / <i>Immediate Cardiopulmonary Stabilization Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
hemostatic (arrest of bleeding) bandage candidates that correct the patient's blood clotting system and new tourniquet technologies suitable for prolonged use.				
<p>FY 2022 Plans: Demonstrate most promising bleeding control intervention candidates for limb and junctional bleeding (bleeding from a junction of the torso to the extremities, i.e., the base of the neck, shoulder, axilla, perineum, buttocks, gluteal area and the groin) through mechanical testing, and provide best practices for bleeding control; engineer battlefield-relevant manikin and employ large animal injury models for demonstration of airway management technologies and devices.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 7638.</p>		-	0.025	-
Accomplishments/Planned Programs Subtotals		2.071	1.727	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>				Project (Number/Name) MN4 / <i>Advanced Life Support Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN4: <i>Advanced Life Support Advanced Technology</i>	-	3.615	3.927	-	-	-	-	-	-	-	0.000	7.542
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is Eliminated.

A. Mission Description and Budget Item Justification

This Project covers development, demonstration, and transition of technologies that enable advanced life support under prolonged care scenarios, including life-support devices that provide lung and kidney functions in casualties with severe injuries and devices and clinical guidelines for the prevention of irreversible organ damage resulting from prolonged lack of blood circulation.

All research is conducted in compliance with Food and Drug Administration (FDA) requirements for licensure of medical products for human use.

Promising efforts identified through Applied Research conducted under Program Element (PE) 0602787A (Medical Technology) / Project MM4 (Cbt Casualty Care Applied Rsch Technology) are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development) / Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Battlefield Sustainment of Critical Organ Function Capability Set 1	3.615	3.797	-
Description: Develop, demonstrate and transition technologies that enable advanced life support under prolonged field care scenarios: life-support devices that provide lung and kidney functions in casualties with severe injuries, and devices and clinical guidelines for the prevention of irreversible organ damage resulting from prolonged lack of blood circulation.			
FY 2022 Plans: Will perform preclinical validation studies of down selected Nitric oxide-release/Non-adhesive coating in extracorporeal life support (ECLS) circuit vs. immobilized heparin standard of care in advanced injury models; mature and demonstrate a single device and pump driven modular platform for lung and renal support that will carry out ECLS without systemic anticoagulation;			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN4 / <i>Advanced Life Support Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
demonstrate portable ECLS platform designed to improve blood oxygenation through first in human study to inform the US critical care community about the safety, feasibility and efficacy of this system in reducing mechanical ventilator settings, and avoiding use of mechanical ventilation in the critically ill. FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.			
Title: SBIR/STTR Tax FY 2022 Plans: SBIR/STTR tax. FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.	-	0.130	-
Accomplishments/Planned Programs Subtotals	3.615	3.927	-

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>			Project (Number/Name) MN5 / <i>Next Generation Blood Products Advanced Technology</i>				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN5: <i>Next Generation Blood Products Advanced Technology</i>	-	6.610	9.394	-	-	-	-	-	-	-	0.000	16.004
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is Eliminated.

A. Mission Description and Budget Item Justification

This Project covers technology development, pre-clinical and early-clinical demonstration, and transition of new blood products with increased shelf life and functionality. Cold-stored platelets, fibrinogen replacement technologies, and pharmaceuticals that protect and metabolically stabilize blood-deprived tissues and reverse impaired blood clotting subsequent to severe injury, will improve prompt hemorrhage control, mitigate effects of shock, and minimize sustainment requirements.

All research is conducted in compliance with Food and Drug Administration (FDA) requirements for licensure of medical products for human use.

Promising efforts identified through Applied Research conducted under Program Element (PE) 0602787A (Medical Technology) / Project MM4 (Cbt Casualty Care Applied Rsch Technology) are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development) / Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation Human-Derived Blood Replacement	6.610	9.275	-
Description: Develop, demonstrate in pre-clinical and early-clinical studies, and transition new blood products with increased shelf life and functionality including cold-stored platelets and biopharmaceutical technologies that stop life threatening bleeding, stabilize tissue metabolism, mitigate shock and restore normal blood clotting will improve prompt hemorrhage control and minimize sustainment requirements.			
FY 2022 Plans: Will perform preclinical studies and early clinical evaluations aimed at extending availability of whole blood, platelets, and plasma to all areas of the battlefield; comparatively demonstrate ability of promising cold-stored platelet additives to extend shelf life and			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN5 / <i>Next Generation Blood Products Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>maintain normal platelet function; validate engineered plasma in a small animal polytrauma model for ability to reverse acute traumatic coagulopathy (a condition in which the blood's ability to form clots is impaired), prolong survival, and improve outcomes; validate currently available portable blood storage and transport containers under a variety of environmental conditions for impact on blood function.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.</p>		-	0.119	-
Accomplishments/Planned Programs Subtotals		6.610	9.394	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology			Project (Number/Name) MN6 / Blast & Head Impact Exposure Monitor Advanced Tech				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN6: Blast & Head Impact Exposure Monitor Advanced Tech	-	1.878	1.546	1.168	-	1.168	-	-	-	-	0.000	4.592
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will inform the development of technologies and strategies to detect and provide actionable information to unit leader/Soldier about hazardous exposure to blast and head impact. This capability will help prevent degradation to Soldier cognitive readiness and performance and enhance combat power.

The cited research is fully coordinated with Program Element (PE) 0602143A (Soldier Lethality Technology) and complimentary to PE 0603118A (Soldier Lethality Advanced Technology) and is fully coordinated with other Services in order to avoid duplication of effort.

The cited work is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Injury Criteria for Informing the Development of New Tactical Head borne Systems.	1.878	1.490	1.168
Description: This effort validates injury risk assessment/guidance/criteria that will inform the development of technologies (i.e., personal protection equipment, vehicles) and strategies (i.e., health hazard assessments) to protect the Soldier against current and emerging operational threats (i.e., blast, blunt, ballistic, and accelerative).			
FY 2022 Plans: Finalize the validation and deliver Go/No Go Readiness predictive algorithm that will alert and inform unit leader/Soldier of cognitive status after a potential injurious head impact and blast exposure has occurred. Finalize the validation and deliver head supported mass criteria in dismounted Soldier environments.			
FY 2023 Plans: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in National Defense Authorization Act 2019 (Sections 711,737). Funding transferred to Program Element 0603115DHA, Project Code 373H.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN6 / <i>Blast & Head Impact Exposure Monitor Advanced Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding decreased due to realignment of US Army Medical Research and Development Command to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.			
Title: SBIR/STTR Tax	-	0.056	-
FY 2022 Plans: SBIR/STTR tax.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 7638.			
Accomplishments/Planned Programs Subtotals	1.878	1.546	1.168

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology				Project (Number/Name) MN7 / Musculoskeletal Injury Screening Tool Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN7: Musculoskeletal Injury Screening Tool Adv Tech	-	3.274	1.664	1.276	-	1.276	0.759	0.822	0.481	0.481	0.000	8.757
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops strategies and technologies to reduce musculoskeletal injury (MSKI) rates and improve outcomes following Return to Duty (RTD) in the Army training, operational, and medical communities to improve Soldier readiness.

The cited research is fully coordinated with Program Element (PE) 0602143A (Soldier Lethality Technology) and complimentary to PE 0603118A (Soldier Lethality Advanced Technology), and is fully coordinated with the Army Training and Doctrine Command (TRADOC) and other Services in order to avoid duplication of effort.

The cited work is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Leader and Medical Provider Tools to Prevent and Reduce Musculoskeletal Injury in All Settings	3.274	1.029	1.276
Description: Project validates in field environment strategies and technologies to reduce MSKI rates and improve outcomes following RTD in the Army training, operational, and medical communities to improve Soldier readiness.			
FY 2022 Plans: Will provide follow-up data, data processing, and dissemination of Nonsteroidal Anti-inflammatory Drugs (NSAIDs) data to the U.S. Army Training and Doctrine Command/Center for Initial Military Training (TRADOC/CIMT); provide the most important modifiable risk factors from validated field musculoskeletal injury data and begin transition of an injury risk capability to TRADOC/CIMT.			
FY 2023 Plans: Will validate and transition musculoskeletal injury risk guidelines to TRADOC-CIMT, complementary applied research efforts will be performed in Program Element 0602787A, Project MK4 (Leader Tools to Reduce Musculoskeletal Injury in All Settings).			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.			
Title: Forward Neuro-Muscular Skeletal Injury Assessment to Reduce Unnecessary Evacuations	-	0.575	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN7 / <i>Musculoskeletal Injury Screening Tool Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: This program will validate solutions to accurately assess the severity of acute, non-penetrating soft-tissue injuries in training and operational environments. This capability once transitioned will show proof of concept of a capability that will improve Soldier readiness and return to duty and limit unnecessary evacuations by accurately diagnosing and assessing musculoskeletal injury.</p> <p>FY 2022 Plans: Will validate field expedient bone imaging technologies; validate use of existing handheld ultrasound technologies with limited use providers for use in the field; validate use of real-time handheld ultrasound to assess soft tissue injury in the field by providers with limited training.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>			
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 2638.</p>	-	0.060	-
Accomplishments/Planned Programs Subtotals	3.274	1.664	1.276

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN9 / <i>Far Forward Behavioral Health Care Advanced Tech</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MN9: <i>Far Forward Behavioral Health Care Advanced Tech</i>	-	1.080	0.283	-	-	-	-	-	-	-	0.000	1.363
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in Fiscal Year 2023 (FY23), this Project is Eliminated and funds have been realigned to Program Element 0602787A (Medical Technology) / Project MK4 (Cbt Casualty Care Applied Rsch Technology).

A. Mission Description and Budget Item Justification

This Project will deliver a tested delivery system for behavioral health interventions oriented to far forward settings that will ensure the psychological readiness of Soldiers and safeguard their far forward readiness and performance in austere operating environments, under high intensity operational stressors.

The cited research is fully coordinated with Program Element (PE) 0602143A (Soldier Lethality Technology) and complimentary to PE 0603118A (Soldier Lethality Advanced Technology), and is fully coordinated with other Services in order to avoid duplication of effort.

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Far Forward Behavioral Health Care	1.080	0.273	-
Description: This effort will deliver a tested delivery system for behavioral health interventions oriented to far-forward settings that will ensure the psychological readiness of Soldiers and safeguard their far-forward readiness and performance in austere operating environments, under high intensity operational stressors.			
FY 2022 Plans:			
Will complete sleep leadership training data analyses demonstrating efficacy of training for improving sleep leadership and sleep behaviors and transition, a brief sleep leadership training module intended for Behavioral Health Officers (BHOs) or their equivalent to provide to unit leadership teams. The training module will be delivered to the United States (US) Army Medical Center of Excellence (MEDCoE) to be incorporated into training courses and to the Office of the Surgeon General (OTSG)			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MN9 / <i>Far Forward Behavioral Health Care Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Behavioral Health Service Line (BHSL). Will optimize the sleep leadership training by conducting interviews with BHOs and incorporating feedback to increase usability, feasibility, and impact of training. FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.				
Title: SBIR/STTR Tax FY 2022 Plans: SBIR/STTR tax. FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.		-	0.010	-
Accomplishments/Planned Programs Subtotals		1.080	0.283	-
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>			Project (Number/Name) MO2 / <i>Traumatic Brain Injury (TBI) Treatment Adv Tech</i>				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MO2: <i>Traumatic Brain Injury (TBI) Treatment Adv Tech</i>	-	4.649	10.667	-	-	-	-	-	-	-	0.000	15.316
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in Fiscal Year 2023 (FY23), funding and mission in this project are realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.

A. Mission Description and Budget Item Justification

This Project covers development, demonstration, transition of technologies for acute battlefield management of brain trauma, and maintains laboratory capability to perform these functions. Efforts include pre-clinical demonstration of drug therapy and resuscitation strategies for treatment of acute brain injury in the pre-hospital setting, biomarkers, diagnostics, and devices, as well as novel drug delivery technologies to facilitate administration of pharmaceuticals at or near the point of injury to protect the injured brain from further damage.

All research is conducted in compliance with Food and Drug Administration (FDA) requirements for licensure of medical products for human use.

Promising efforts identified through Applied Research conducted under Program element (PE) 0602787A (Medical Technology) / Project MM4 (Cbt Casualty Care Applied Rsch Technology) are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development) / Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Drugs to Prevent and Treat Brain Injury (TBI)	4.649	10.418	-
Description: Develop, demonstrate, and transition technologies to treat combat-related brain injury. Technologies include drugs administered at or near the point of injury to treat combat-related brain injury while also stabilizing and protecting non-injured brain tissues, and novel drug delivery platforms that specifically target injured brain cells.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO2 / <i>Traumatic Brain Injury (TBI) Treatment Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will evaluate a novel drug-releasing gel material designed for application at point of injury that will safely seal open penetrating brain injuries, protecting exposed brain tissue from further injury while simultaneously releasing potent anti-inflammatory, antibiotic drugs directly to the injured brain; validate prehospital intranasal administration of drugs to preserve brain cell function following traumatic brain injury. Will continue studies to demonstrate effectiveness of new drugs developed to preserve brain cell function following traumatic brain injury; optimize approaches to treating traumatic brain injured casualties, who have also been exposed to nerve agent.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.</p>		-	0.249	-
Accomplishments/Planned Programs Subtotals		4.649	10.667	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>				Project (Number/Name) MO4 / <i>Burn Recovery Optimization Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MO4: <i>Burn Recovery Optimization Advanced Technology</i>	-	3.326	2.059	-	-	-	-	-	-	-	0.000	5.385
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in Fiscal Year 2023 (FY23), funding and mission in this project are realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.

A. Mission Description and Budget Item Justification

This Project covers technology development, demonstration, and transition of burn recovery optimization technologies, including diagnostic technology to predict skin graft success or failure, technologies to measure and predict burn wound healing rate and assess burn treatment effectiveness, and novel dressings that protect severe burn wounds from further injury and prevent inflammation and infection until definitive surgical burn care is available.

All research is conducted in compliance with Food and Drug Administration (FDA) requirements for licensure of medical products for human use.

Promising efforts identified through Applied Research conducted under Program Element (PE) 0602787A (Medical Technology) / Project MM4 (Cbt Casualty Care Applied Rsch Technology) are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development) / Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Rapid Burn Injury Treatment and Return to Duty Capability Set 1	3.326	2.035	-
Description: Mature, demonstrate, and transition burn recovery optimization technologies. These include diagnostic technology to predict skin graft success or failure, and advanced dressings that contain anti-infective and anti-inflammatory agents for prehospital use to protect severe burn wounds from further injury, infection and inflammation for prolonged periods until definitive surgical wound care is provided.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO4 / <i>Burn Recovery Optimization Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Validate best approach for giving fluids to burn patients (by mouth or intravenously) through a small clinical study; demonstrate new therapies to be deployed by medics at the point of injury to safely remove dead skin and underlying tissues from burn wounds in order to prevent infection; validate two new anti-bacterial agents to provide data for which is most effective in reducing infections in burn wounds; perform validation studies of a hand-held device designed to assess severity of burn wounds through non-contact measurement of the wound's size and depth.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>			
<p><i>Title:</i> SBIR/STTR Tax</p> <p><i>FY 2022 Plans:</i> SBIR/STTR tax.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638.</p>	-	0.024	-
Accomplishments/Planned Programs Subtotals	3.326	2.059	-

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO7 / <i>Improved Bone Repair Advanced Technology</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>MO7: Improved Bone Repair Advanced Technology</i>	-	1.564	1.069	-	-	-	-	-	-	-	0.000	2.633
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in Fiscal Year 2023 (FY23), funding and mission in this project are realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.

A. Mission Description and Budget Item Justification

This Project matures, demonstrates, and validates promising medical technologies and new clinical practices to improve outcomes following severe limb injuries involving complex bone fractures and injured surrounding soft tissues.

All research is conducted in compliance with Food and Drug Administration (FDA) requirements for licensure of medical products for human use.

Promising efforts identified through Applied Research conducted under Program Element (PE) 0602787A (Medical Technology), Project MM4 (Cbt Casualty Care Applied Rsch Technology), are further matured under this Project. Promising results identified under this Project are further matured under PE 0603807A (Medical Systems Advanced Development), Project 836 (Field Medical Systems Advanced Development).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Limb Function Repair and Return to Combat Duty and Field Stabilization on Bone in Preparation for Evac	1.564	-	-
Description: Development, demonstration, and transition of technologies that improve outcomes, mobility and return to duty following severe limb injuries involving complex bone fractures and injured soft tissues.			
Title: Field Stabilization of Bone in Preparation for Evac	-	0.554	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO7 / <i>Improved Bone Repair Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: Maturation, demonstration, and transition of technologies that improve outcomes, mobility, and return to duty following severe limb injuries involving complex bone fractures and injured soft tissues in casualties treated under multi-domain operations conditions.</p> <p>FY 2022 Plans: Develop and demonstrate prototype noninvasive external fixation device for stabilization of lower extremity fractures with weight bearing support to enhance casualty mobility.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: Limb Function Repair and Return to Combat Duty</p> <p>Description: Maturation, demonstration, and transition of technologies that improve outcomes, and return to duty following severe limb injuries involving complex bone fractures and injured soft tissues.</p> <p>FY 2022 Plans: Will validate local and regional antibiotic delivery strategies to achieve therapeutic soft tissue antibiotic levels during and after tourniquet induced ischemia (an inadequate blood supply to an extremity) in a large animal model and will validate if intervention reduces level of infection within an open wound distal to the tourniquet; demonstrate alternative portable technologies to aid medics in diagnosing acute extremity compartment syndrome (increased pressure within a confined body space, especially of the leg or forearm. May require surgery and loss tissue or extremity).</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>		-	0.496	-
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>		-	0.019	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO7 / <i>Improved Bone Repair Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638.			
Accomplishments/Planned Programs Subtotals	1.564	1.069	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technol ogy				Project (Number/Name) MO8 / Expeditionary Performance Nutrition Advanced Techn			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MO8: Expeditionary Performance Nutrition Advanced Techn	-	2.062	1.936	0.175	-	0.175	0.728	0.163	0.163	0.163	0.000	5.390
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project covers the development of real-time, specific, and individualized interventions to optimize mental acuity and fatigue and manage metabolic and nutritional needs to sustain Soldier physical, mental, and immunological performance.

The cited research is fully coordinated with Program element (PE) 0602143A (Soldier Lethality Technology) and complimentary to PE 0603118A (Soldier Lethality Advanced Technology), and is fully coordinated with other Services in order to avoid duplication of effort.

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Medical Strategies to Sustain Soldier Alertness and Performance in All Settings	2.062	1.929	0.175
Description: Develop real-time, specific, and individualized interventions to optimize mental acuity and fatigue and manage metabolic and nutritional needs to sustain Soldier physical, mental, and immunological performance.			
FY 2022 Plans: Will continue validation of interventions to mitigate sleep loss and fatigue and improve individual and team performance in training and operational settings, including multi-domain battle scenarios. Will continue to demonstrate the utility and effectiveness of electrical stimulation technologies that provide direct current to the brain, in addition to acoustic stimulation of brain patterns during sleep, as neurocognitive interventions for the enhancement of recuperative sleep and the development of operationally relevant sleep strategies.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO8 / <i>Expeditionary Performance Nutrition Advanced Techn</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Develop evidence-based recommendations for nutritional interventions in Soldiers undergoing strenuous, high OPTEMPO, dispersed and disaggregated operations to reduce physical, cognitive and psychological degradation and provide overmatch capability. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased due to realignment of US Army Medical Research and Development Command to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.				
Title: SBIR/STTR Tax FY 2022 Plans: SBIR/STTR tax. FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.		-	0.007	-
Accomplishments/Planned Programs Subtotals		2.062	1.936	0.175
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO9 / <i>Vaccines to Prevent Dengue Fever Advanced Tech</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>MO9: Vaccines to Prevent Dengue Fever Advanced Tech</i>	-	2.037	-	-	-	-	-	-	-	-	0.000	2.037
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project covers technology development, demonstration and transition of a candidate vaccine for the prevention of Dengue fever caused by any of the four Dengue virus serotypes. The vaccine is intended to be effective in people with and without a prior history of Dengue infection. Research is conducted in compliance with Food and Drug Administration (FDA) regulations for medical products for human use.

Promising medical countermeasures identified in this Project are further matured under Program Element 0603807A (Medical Systems Advanced Development) / Project 808 (DoD Drug & Vacc Ad).

The cited research is consistent with the Under Secretary of Defense (Research and Engineering) science and technology focus areas and the Army Modernization Strategy.

Research is managed by the United States Army Medical Research and Development Command (USAMRDC) in coordination with the Naval Medical Research Center (NMRC). The Army is responsible for programming and funding all Department of Defense (DoD) naturally occurring infectious disease research requirements, thereby precluding duplication of effort within the Military Departments.

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

	FY 2021	FY 2022	FY 2023
Title: Vaccines to Prevent Dengue Fever Advanced Technology	2.037	-	-
Description: Perform Good Manufacturing Practice (GMP) manufacture of Dengue vaccine candidate. Demonstrate Dengue vaccine candidate safety, effectiveness, and pharmacokinetics in humans. Transition the Dengue vaccine candidate to product developer.			
Accomplishments/Planned Programs Subtotals	2.037	-	-

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

N/A

Remarks

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MO9 / <i>Vaccines to Prevent Dengue Fever Advanced Tech</i>

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603002A / Medical Advanced Technology				Project (Number/Name) MP3 / Phys Chem Toxicity Assessment Sys Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
MP3: Phys Chem Toxicity Assessment Sys Adv Tech	-	2.590	2.291	1.839	-	1.839	1.790	1.073	0.355	0.354	0.000	10.292
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project covers the development of products and solutions that will protect and prevent degradation of Soldier health, readiness and performance from environmental stressors (heat, cold, altitude, and chemical toxicants) while conducting prolonged operations in Multi-Domain Operations (MDO). Develop algorithms and physiological models to inform unit leaders and Soldiers and provide actionable information and interventions to manage metabolic needs, maintain performance, and avoid non-battle injuries while operating in extreme environments.

This Project contains no duplication with any effort within the Military Departments and includes direct participation by other Services. The cited research is fully coordinated with Program Element (PE) 0602143A (Soldier Lethality Technology) and complimentary to PE 0603118A (Soldier Lethality Advanced Technology).

The cited research is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology, focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, MD.

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

	FY 2021	FY 2022	FY 2023
Title: Solutions to Sustain Warfighter Performance in Extreme Environments	2.590	2.208	1.839
Description: Protect and prevent degradation of Soldier health, readiness and performance from environmental stressors (heat, cold, altitude, chemical toxicants) while conducting prolonged operations in the MDO. Develop algorithms and physiological models to inform unit leaders and Soldiers and provide actionable information and interventions to manage metabolic needs, maintain performance, and avoid non-battle injuries while operating in extreme environments.			
FY 2022 Plans: Will provide validated tools to sustain lethality and optimize performance and to prevent injuries related to multi-environmental stressors; optimize capability to improve performance and thermal comfort in hot environments using innovative cooling technology; deliver to advanced development mature and validated algorithms for exertional heat injury, acute mountain sickness, and cold-weather clothing selection; complete animal model to demonstrate capability to use real-time physiological data to			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603002A / <i>Medical Advanced Technology</i>	Project (Number/Name) MP3 / <i>Phys Chem Toxicity Assessment Sys Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
determine the extent to which an individual has been exposed to a toxic chemical; begin validation of method for cold habituation to improve cold tolerance and comfort when operating in arctic conditions. FY 2023 Plans: Will provide validated tools to sustain lethality and optimize performance and to prevent injuries related to multi-environmental stressors; optimize capability to improve performance and thermal comfort in hot environments using innovative cooling technology; deliver to advanced development mature and validated algorithms for exertional heat injury, acute mountain sickness, and cold-weather clothing selection; begin validation of method for cold habituation to improve cold tolerance and comfort and reduce frostbite when operating in arctic conditions; and conduct field validation and acceptability of novel physiological status monitoring (PSM) compression shirts. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased due to realignment of US Army Medical Research and Development Command to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.			
Title: SBIR/STTR Tax FY 2022 Plans: SBIR/STTR tax. FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.	-	0.083	-
Accomplishments/Planned Programs Subtotals	2.590	2.291	1.839

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603007A / <i>Manpower, Personnel and Training Advanced Technology</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	11.344	14.273	15.598	-	15.598	16.514	18.206	17.252	17.248	0.000	110.435
792: <i>Personnel Performance & Training</i>	-	11.344	14.273	15.598	-	15.598	16.514	18.206	17.252	17.248	0.000	110.435

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and validates applied behavioral and social science technologies that enhance the Soldier Lifecycle (e.g., selection, assignment, training, leader development) and human relations (e.g. unit cohesion). These technologies provide advanced personnel measures that more fully assess potential and predict performance, behavior, attitudes, and resilience. These technologies also provide innovative and effective Talent Management methods to optimize individual and team performance to ensure the Army can meet mission requirements in uncertain and complex environments. This PE evaluates new selection measures, assignment methods, and performance metrics for individuals and units, assesses innovative training methods, and conducts scientific assessments to inform Human Capital policy and programs. Work in this PE will result in effective non-materiel solutions to help the Army adjust to changes in force size and structure, a variety of mission demands and contexts, challenges in human relations, and budgetary constraints.

Work in this PE complements and is fully coordinated with PE 0602785A (Manpower/Personnel/Training Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Vision, the Army's Talent Management Strategy, and the Army Modernization Strategy

Work in this PE is performed by the United States Army Research Institute (ARI) for the Behavioral and Social Sciences in Ft. Belvoir, VA.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	11.344	14.273	0.000	-	0.000
Current President's Budget	11.344	14.273	15.598	-	15.598
Total Adjustments	0.000	0.000	15.598	-	15.598
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	15.598	-	15.598

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity
2040: *Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)*

R-1 Program Element (Number/Name)
PE 0603007A / *Manpower, Personnel and Training Advanced Technology*

Change Summary Explanation

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603007A / <i>Manpower, Personnel and Training Advanced Technology</i>				Project (Number/Name) 792 / <i>Personnel Performance & Training</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>792: Personnel Performance & Training</i>	-	11.344	14.273	15.598	-	15.598	16.514	18.206	17.252	17.248	0.000	110.435
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrate applied behavioral and social science technologies that enhance the Soldier Lifecycle (e.g., selection, assignment, training, leader development) and human relations (e.g., unit cohesion). These technologies provide advanced personnel measures that more fully assess potential and predict performance, behavior, attitudes, and resilience. These technologies also provide innovative and effective Talent Management methods to optimize individual and team performance to ensure the Army can meet mission requirements in uncertain and complex environments. This demonstrates new selection measures, assignment methods, and performance metrics for individuals and units; assesses innovative leader development and learning methods, and conducts scientific assessments to inform Human Capital policy and programs. Research will result in effective non-materiel solutions to help the Army adjust to changes in force size and structure, a variety of mission demands and contexts, challenges in human relations, and budgetary constraints.

Work in this Project complements PE 0602785A (Personnel Performance & Training Technology)

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas, the Army Vision, the Army People Strategy, the Army's Talent Management Strategy, and the Army Modernization Strategy.

Work is performed by the United States Army Research Institute (ARI) for the Behavioral and Social Sciences in Fort Belvoir, VA.

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

	FY 2021	FY 2022	FY 2023
Title: Talent Assessment and Development	11.344	13.865	15.598
<p>Description: This effort optimizes and demonstrates innovative talent management approaches to provide the Army the flexibility to adapt to changes in force structure and recruiting environments. This effort matures Soldier selection measures, techniques, and tools to more fully assess Soldier potential and better predict behavior, attrition, Soldier performance, and team effectiveness. This effort also matures and demonstrates methods that develop and model Soldier talents/competencies longitudinally across a career.</p> <p>FY 2022 Plans: Will mature research to validate personnel assessment measures to improve selection and assignment by applying additional psychometric analyses to improve a Functional Area longitudinal assessment and assessments designed to predict Officer performance and continuance; mature and validate methods to develop critical leader competencies, such as mindfulness and</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603007A / <i>Manpower, Personnel and Training Advanced Technology</i>	Project (Number/Name) 792 / <i>Personnel Performance & Training</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
strategic thinking competencies; mature research and collect data to demonstrate psychometric validity of small unit performance measurement tools. <i>FY 2023 Plans:</i> Will mature prototype assessment batteries to improve integrated personnel assessments for Officer selection and assignment; mature and validate augmented assessment prototypes designed to automatically generate personnel assessment content; validate leader development methods for junior NCOs; optimize small unit performance measurement tools. <i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding change reflects planned lifecycle of this effort.			
<i>Title:</i> FY22 SBIR/STTR Transfer <i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638 <i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638	-	0.408	-
Accomplishments/Planned Programs Subtotals	11.344	14.273	15.598

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603025A / <i>Army Agile Innovation and Demonstration</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	22.231	20.900	-	20.900	23.055	24.106	32.900	30.136	0.000	153.328
CK8: <i>Advanced Technology Development and Convergence</i>	-	-	22.231	15.200	-	15.200	15.252	15.272	16.266	16.312	0.000	100.533
DA3: <i>Army Advanced Innovation</i>	-	-	-	5.700	-	5.700	7.803	8.834	16.634	13.824	0.000	52.795

A. Mission Description and Budget Item Justification

This Program Element (PE) funds the Army's goal of accelerating innovative solutions to achieve future force modernization. The Army is developing new ways of doing business to include strategic and "non-traditional" partnerships and working with traditional vendors in novel ways to allow for agile integration of leading-edge technology. Critical technologies that allow for technological superiority are increasingly dual-use or developed in academia-led partnerships that leverage cutting edge innovation. In an era of global competition, technological superiority requires agile and rapid innovation. Cross-cutting modernization initiatives leverage strategic partnerships foster an environment to bring knowledge and expertise to demonstrate breakthrough and innovative technologies that will benefit the warfighter. These collaborations bring new ways of doing business to demonstrate emerging technologies and systems with high payoff potential to address current technology shortfalls or future capability gaps and systems. This PE will also allow for exploration and adaptation of various technologies in the early stages of development enabling cost saving decisions in the procurement life-cycle by using the try, buy, decide model of identifying and investing in proof of technology demonstrations that the army can adapt and integrate. Leveraging other innovative mechanisms, to include accelerators, incubators, and other technology accelerants, to enhance innovation is part of the overall innovation strategy. Innovation includes not only hardware, and physical products but also software, software development, artificial intelligence (AI) and machine learning, all as stand-alone initiatives and as part of broader innovation to programs and technology development. Oversight from a newly created Innovation Board will evaluate internal and external constraints to implementation on the basis of Army modernization needs, Army standards and resources to inform an optimal technology investment strategy.

Research in this PE is closely coordinated with PE 0602002A (Army Agile Innovation and Development-Applied Research).

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

Research is performed by the United States Army Futures Command.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603025A / <i>Army Agile Innovation and Demonstration</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	22.231	0.000	-	0.000
Current President's Budget	0.000	22.231	20.900	-	20.900
Total Adjustments	0.000	0.000	20.900	-	20.900
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	20.900	-	20.900

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603025A / Army Agile Innovation and Demonstration				Project (Number/Name) CK8 / Advanced Technology Development and Convergence			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CK8: <i>Advanced Technology Development and Convergence</i>	-	-	22.231	15.200	-	15.200	15.252	15.272	16.266	16.312	0.000	100.533
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project aims to accelerate the Army's goal of finding innovative and nontraditional solutions to the most difficult technological problems. Efforts to pair with nontraditional entities, such as industry or the newly established Army Futures Command Software Factory, bring new ways of doing business to demonstrate emerging technologies and systems with high payoff potential to address current technology shortfalls or future capability gaps and systems. Additionally, this project seeks to provide funding for advanced research/technology that has been discovered in "Innovation Days" that are funded across the Research, Development, Test and Evaluation (RDT&E) appropriation.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project supports all Army Modernization Priorities.

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Technology Development of Existing Commercial Technology	-	5.781	10.200
<p>Description: Advanced commercial development exists when direct investment leads to rapid technology applications and demonstration. The Army identifies existing technology to further develop and modify for Army use. Partnerships with industry both traditional and non-traditional, allow the Army to advance non-military commercial research and development investments through focused engagements resulting in commercial adaption and integration to address Army technology and modernization efforts. Initial nominal Army investment in proof of technology and technology demonstrations will expedite novel technologies shaping their development to meet Army requirements and expedite both component and complete system adaptation and integration.</p> <p>FY 2022 Plans: The Army enterprise will identify commercial solutions to technology problem areas focused on next generation combat vehicles, dismounted soldier lethality, power generation and storage, network and satellite support, and novel sensors and technologies.</p> <p>FY 2023 Plans:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603025A / Army Agile Innovation and Demonstration	Project (Number/Name) CK8 / Advanced Technology Development and Convergence		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>The Army enterprise will identify commercial solutions to technology problem areas focused on next generation combat vehicles, dismounted soldier lethality, power generation and storage, infrastructure to enable power generation, data driven human performance and Soldier readiness, AI and robotic enabled small units, network and satellite support, and novel sensors and technologies.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year 2023 (FY23), funding for this effort was realigned from the Sub-System Component and Prototype Convergence task within this effort.</p>				
<p>Title: Sub-System Component and Prototype Convergence</p> <p>Description: The Army investigates, develops, and integrates non-traditional cutting-edge technology. Sub-system component and prototype convergence seeks to develop or integrate one or more technologies to prove out concepts or to merge smaller subsystems towards a more complex solution. This task informs requirements developers where the state of technologies is at, where it is going and on what timeline confirming viability for incorporation into larger technology programs.</p> <p>FY 2022 Plans: Will focus on subsystem component development and maturation of autonomous technologies focused on the integration of disjointed systems, remote predictive maintenance, component hardening (against cyber) of IT and communications systems on manned and unmanned vehicles, network and satellite technologies, and Soldier exoskeletons.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 funding for this effort is realigned to the Advanced Technology Development of Existing Commercial Technology task within this effort.</p>		-	3.854	-
<p>Title: Experimentation and Development of Commercial Dual Use Technologies</p> <p>Description: The Army seeks to connect with industry early in a technology's commercialization process. Experimentation and development will connect with these non-traditional technologies to determine the feasibility and ability to be leveraged against military applications. Technology development will be conducted concurrently to commercial activities with experimentation used to understand proof-of-concept applicability for further Government initiative. As part of this process strategic partnerships will be cultivated with technology aggregators such as In-Q-Tel to ensure a comprehensive approach to connect and transition technologies to the Army.</p> <p>FY 2022 Plans:</p>		-	4.818	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603025A / Army Agile Innovation and Demonstration	Project (Number/Name) CK8 / Advanced Technology Development and Convergence		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will focus experimentation and development on intelligent connectivity between systems and novel sensors and sensor techniques.				
FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 funding in this task is realigned to Project DA3 (Army Advanced Innovation) in this Program Element (PE).				
Title: Software Factory Advanced Software Development		-	4.721	5.000
Description: As part of the novel Software Factory stood up by Army Futures Command (AFC), Soldiers will be leveraged to address some of the most challenging software research problems that the Army faces. Soldiers will adopt an Agile Development Process to rapidly mature experimental software for mobile technology, secure authentication procedures, and other software needs for Army-specific hardware platforms.				
FY 2022 Plans: Will design, characterize, and mature software supporting Army wide hardware platforms; will develop and demonstrate the ability to quickly route Soldier created software to mobile devices in an iterative fashion; and will integrate Soldier created software into a secure DevOps environment.				
FY 2023 Plans: Software Factory will integrate Soldier-created software closer to the tactical edge using secure authentication procedures and field deployable capabilities. In FY23 Software Factory will add two new focus areas for software development supporting Army Modernization that include Lines of Effort Common Operating Environment, Command Post, Modular Open Systems Approach (MOSA), Robotics and Autonomous Systems, Soldier Situational Awareness and Synthetic Training.				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned life cycle of effort.				
Title: Demonstration and Development of Army Discovered Innovative Technologies		-	2.246	-
Description: The Army seeks to develop and demonstrate technology that display unique and innovative potential in a cross-domain fashion. This effort seeks to direct advanced research funding towards technologies that are discovered from Army Innovation events such as Innovation Days funded by PE 0605054A (Emerging Technology Initiatives) / Project FI3 (Rapid Capability Development and Maturation) or the Expeditionary Technology Search effort in PE 0605803A (Technical Information Activities) / Project CC2 (Expeditionary Technologies).				
FY 2022 Plans:				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603025A / Army Agile Innovation and Demonstration	Project (Number/Name) CK8 / Advanced Technology Development and Convergence		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will develop and demonstrate unique solutions to Army wide problems leveraging technology discovered through Army technology search events. FY 2022 to FY 2023 Increase/Decrease Statement: Funding is administratively realigned to Project DA3 (Army Advanced Innovation) within this same PE and also PE 0602002A (Army Agile Innovation and Development- Applied Research) / Project DC4 (Army Applied Innovation).				
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.811	-
Accomplishments/Planned Programs Subtotals		-	22.231	15.200
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603025A / Army Agile Innovation and Demonstration	Project (Number/Name) DA3 / Army Advanced Innovation
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DA3: Army Advanced Innovation	-	-	-	5.700	-	5.700	7.803	8.834	16.634	13.824	0.000	52.795
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

In Fiscal Year 2023 (FY23), this Project is a new start.

A. Mission Description and Budget Item Justification

This Project funds the Advanced Development portion of the Army Innovation Plan, the Army's investment strategy to rapidly accelerate innovative solutions to challenging Warfighter problems. This Project will provide the Army with the most advanced and cutting-edge solutions with the ability to adapt and integrate multi-disciplinary innovative technologies by bridging the interfaces between internal and external efforts for a holistic entry into the acquisition pipeline at the most appropriate milestone. This Project also seeks to further develop and demonstrate these technologies in support of cross-domain operations, with emphasis on open/modular systems architecture and digital thread/engineering, and provide a pathway for entry into the acquisition process.

This Project is coordinated with PE 0602002A (Army Agile Innovation and Development-Applied Research) / Project DC4 (Army Applied Innovation).

Army Senior Leadership approves Army innovation projects prior to budget year programming based on priority, opportunity, and return on investment for the American taxpayer- ensuring that innovations have a high potential for filling capability gaps and transitioning.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project supports all Army Modernization Priorities.

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

	FY 2021	FY 2022	FY 2023
Title: Army Advanced Innovation	-	-	5.700
Description: The Army seeks to develop and demonstrate technology that display unique and innovative potential in a cross-domain fashion. This effort will serve as funding to rapidly transition disruptive and groundbreaking capabilities that fall outside of the normal acquisition pipeline.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603025A / <i>Army Agile Innovation and Demonstration</i>	Project (Number/Name) DA3 / <i>Army Advanced Innovation</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Initiate a competitive process that selects technologies with a high promise of advancing and accelerating capabilities to be investigated in open systems and digital engineering architectures, prior to be transitioned either to further Science and Technology efforts, or Research Development Testing & Evaluation (RDTE) Budget Activity (BA) 6.4 funding, depending on the technology readiness level (TRL) at the end of the effort. The Army Innovation Program will accept multiple new efforts that support Army Modernization, to include cyber, Electronic Warfare, Sensors, Power and Energy, Artificial Intelligence and Autonomy, Communications, Position, Navigation and Timing, advancing Synthetic Training Environments; and Air and Ground Platform integration.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> In FY23, this project is a new start.</p>			
Accomplishments/Planned Programs Subtotals	-	-	5.700

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603040A / Artificial Intelligence and Machine Learning Advanced Technologies
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	0.909	6.395	-	6.395	7.759	12.675	8.813	9.070	0.000	45.621
CL1: AI Enhanced Intel Operations Advanced Technologies	-	-	0.371	1.424	-	1.424	1.353	5.715	2.071	2.070	0.000	13.004
CL6: ATR Using Multiple Cooperative Sensors Adv Tech	-	-	0.538	1.883	-	1.883	1.587	2.078	1.925	1.925	0.000	9.936
CN6: Predictive Maintenance Advanced Technology	-	-	-	2.311	-	2.311	3.779	3.843	3.777	3.776	0.000	17.486
DA7: AI-Enabled Command and Coordination Adv Tech	-	-	-	0.777	-	0.777	1.040	1.039	1.040	1.299	0.000	5.195

Note

Project CN6 (Predictive Maintenance Advanced Technology) and Project DA7 (AI-Enabled Command and Coordination Adv Tech) are New Starts in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Program Element (PE) will mature and demonstrate advanced technologies using artificial intelligence (AI) and machine learning (ML) to improve target recognition/detection using multiple cooperative autonomous sensors, leader decision-making, and replication of tactical behaviors to enable autonomous capabilities for maneuver, predictive maintenance, talent management, Intel support for Operations, network and cybersecurity and medical support. The Army's Artificial Intelligence Integration Center (AI2C) will provide strategic guidance and coordination of these advanced research efforts in AI/ML across the Army Modernization enterprise.

Research in this PE contributes to the Army Science and Technology (S&T) portfolio and is fully coordinated with efforts in PE 0601601A (Artificial Intelligence Basic Research) and PE 0602180A (Artificial Intelligence Technologies)

The cited research is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas, the Army Modernization Strategy and the Joint Artificial Intelligence Center (JAIC).

Research in this PE is performed by the United States Army Futures Command (AFC).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>
---	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	0.909	0.000	-	0.000
Current President's Budget	0.000	0.909	6.395	-	6.395
Total Adjustments	0.000	0.000	6.395	-	6.395
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	6.395	-	6.395

Change Summary Explanation

FY23 funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>				Project (Number/Name) CL1 / <i>AI Enhanced Intel Operations Advanced Technologies</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CL1: <i>AI Enhanced Intel Operations Advanced Technologies</i>	-	-	0.371	1.424	-	1.424	1.353	5.715	2.071	2.070	0.000	13.004
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate various technologies to augment human analysts using Artificial Intelligence (AI)-enabled decision support and recommendation tools supporting Long Range Precision Fires, Mission Command, and Maneuver Commanders. This Project will help bridge the research and technology gap within intelligence support to operations and the sensor to shooter thread. This Project also complements and coordinates with the applied research in Program Element (PE) 0602180A (Artificial Intelligence Technologies) / Project CL2 (AI Enhanced Intel Operations Technologies).

The cited research is consistent with the Army Modernization Strategy and is supported and coordinated with the Army Intel Community, Army Futures Command, and the Army Intelligence, Surveillance, and Reconnaissance (ISR) Task Force.

Research in this Project supports the Army Science and Technology Lethality Portfolio and the Joint Artificial Intelligence Center (JAIC).

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: AI Enhancements for Prometheus	-	0.357	0.622
Description: Prometheus is an umbrella of capabilities to support sensor to shooter automation for the strategic, operational, and tactical levels. This effort will mature and demonstrate computer vision and deep learning capabilities to automatically triage data collection and hard-to-spot indications and warnings (I&W) to support targeting, allowing human intelligence analysts to do the higher-value work of determining if a given lead represents a valid threat.			
FY 2022 Plans: Maturation of AI algorithms for automated detection of adversarial objects of interest and automated intelligence collection management; will improve AI collection management and tasking capability, automate AI workflows, and document repeatable processes for deploying AI capabilities to meet Army needs.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>	Project (Number/Name) CL1 / <i>AI Enhanced Intel Operations Advanced Technologies</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate that the algorithms matured on this project can generate artificial data, and that this artificial data is realistic enough to train an AI system in place of real data. Will validate the full methodology on a military-related problem where the system will generate artificial data and use that artificial data to re-train a military AI-system like Prometheus.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increased funding will be used to mature and demonstrate algorithms for automated object detection and automated intelligence collection management, building on effort ending mid-year FY23 in Project CL2 (AI Enhanced Intel Operations Technologies) in this same PE.</p>				
<p>Title: Intelligence Fusion for Targeting</p> <p>Description: Will address a ?multi-INT? fusion problem and demonstrate how AI algorithms can fuse data from various military intelligence systems via simulated testing.</p> <p>FY 2023 Plans: Will demonstrate the ability of the algorithm to fuse data from various military intelligence systems (ARCANE series, Prometheus, and ATR-MCAS) in a simulated test. Will then demonstrate the algorithm performing fusion of real-world intelligence data to show improved target confirmation over what can be provided by any single AI-enabled sensor. Will work with product owners of TITAN and SHOT systems to exploit the fusion algorithm and the required data pipelines.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This effort initiates in FY23.</p>		-	-	0.802
<p>Title: SBIR/STTR Transfer</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.014	-
Accomplishments/Planned Programs Subtotals		-	0.371	1.424
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>				Project (Number/Name) CL6 / <i>ATR Using Multiple Cooperative Sensors Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CL6: <i>ATR Using Multiple Cooperative Sensors Adv Tech</i>	-	-	0.538	1.883	-	1.883	1.587	2.078	1.925	1.925	0.000	9.936
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate a team of air and ground sensors that use Artificial Intelligence (AI) and Machine Learning (ML) to autonomously navigate and collaborate through shared perception of the optical, thermal, and electromagnetic spectrums to find, identify, geo-locate, and track targets during reconnaissance missions. This Project also complements and fully coordinates with the applied research in Program Element (PE) 0602180A (Artificial Intelligence Technologies) / Project CL7 (ATR Using Multiple Cooperative Sensors App Tech).

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

Research in this Project supports the Army Science and Technology Lethality Portfolio and the Joint Artificial Intelligence Center (JAIC).

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Collaborative Target Detection and Tracking	-	0.519	1.365
Description: This effort will mature and demonstrate an AI-enabled scalable team of autonomous air and ground vehicles that will cooperatively conduct a zone recon to identify, geolocate, and track threats using on-board electronic intelligence (ELINT) and electro optical-infrared (EO-IR) sensors.			
FY 2022 Plans: Will refine and mature the AI-enabled target recognition architecture to classify threats at the tactical edge; will integrate novel technologies that uses ELINT sensing to enhance sensing and tracking during zone reconnaissance.			
FY 2023 Plans: Will mature and optimize the threat, terrain, and perception architecture for maneuver and threat classification at the tactical edge. Will integrate sensors to detect and geo-locate radio emissions to influence search areas and accelerate target localization. Will improve interfaces with the cloud environment by integrating ATR-MCAS with Integrated Visual Augmentation System (IVAS) voice recognition, and demonstrating a 100% cloud-based data pipeline with linkages to COEUS/cARMY on IL5.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>	Project (Number/Name) CL6 / <i>ATR Using Multiple Cooperative Sensors Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Increased funding will mature the ability for unmanned vehicles to self-identify and geo-locate targets and share target data among unmanned and manned teams for verification.				
Title: COEUS Advanced Technology		-	-	0.518
FY 2023 Plans: Will optimize ATR-MCAS through the use of COEUS, a modular software platform (cloud native).				
FY 2022 to FY 2023 Increase/Decrease Statement: This effort is a new effort in Fiscal Year 2023 (FY23).				
Title: SBIR/STTR Transfer		-	0.019	-
FY 2022 Plans: Funding transferred in accordance with Title 15 USC 2638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 2638				
Accomplishments/Planned Programs Subtotals		-	0.538	1.883
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>				Project (Number/Name) CN6 / <i>Predictive Maintenance Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CN6: <i>Predictive Maintenance Advanced Technology</i>	-	-	-	2.311	-	2.311	3.779	3.843	3.777	3.776	0.000	17.486
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates artificial intelligence (AI) and machine learning (ML) tools and capabilities to predict and analyze maintenance status for emerging and legacy aviation and ground platforms. Will extract maintenance data from databases and sensor data and make inferences of missing data via virtual simulations and improve and provide AI data capture and other AI tools for enterprise maintenance resource planning for military aviation and ground vehicles. Platforms of focus will be prioritized by cost and value to Army missions and include the UH60, AH64, CH47, Stryker, and Abrams. Each platform will be sequentially evaluated both at the appropriate component (i.e. engine health) and fleet level. This Project matures and demonstrates the use of predictive maintenance to increase fleet operational readiness through reduced downtime by preventing critical failure during missions, maximizing availability to combatant commands. Results from the Project will also be used to inform a robust Army wide predicative maintenance platform that will accelerate the pace of innovation for this problem set. This platform includes data engineering, pipelines, AI development eco-system, and application delivery. All outcomes will be used to inform requirements and technical architectures for modernization efforts of next generation aviation and ground systems both manned and unmanned.

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

Research in this Project supports the Army Science and Technology Ground Portfolio and the Joint Artificial Intelligence Center (JAIC).

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: PMx Platform Data Management and Integrated Environment Refinement	-	-	2.311
Description: Will mature and optimize a predictive maintenance (PMx) cloud-based environment, mature and validate data collection/aggregation techniques, and demonstrate and validate a data architecture and the data pipelines to a cloud-based environment.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>	Project (Number/Name) CN6 / <i>Predictive Maintenance Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>This effort will mature and demonstrate the integrated development, security, and operations (DevSecOps) PMx environment. Will provide the capability to aggregate data at the point of the maintenance activity and establish multiple pipelines to transition the aggregated data to a scalable, cloud-based data management environment. Will exploit the cloud-based data management architecture and initiate scaling to ground-based systems.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> This is a new start in FY23.</p>			
Accomplishments/Planned Programs Subtotals	-	-	2.311

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>				Project (Number/Name) DA7 / <i>AI-Enabled Command and Coordination Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DA7: <i>AI-Enabled Command and Coordination Adv Tech</i>	-	-	-	0.777	-	0.777	1.040	1.039	1.040	1.299	0.000	5.195
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates solutions for Artificial Intelligence (AI)-enabled Command and Coordination that provide timely understanding and application of the commander's intent. This Project improves sensor-to-shooter and course of action development timelines by developing algorithms, software, and hardware to efficiently capture, transport, process, and convey complex battlefield data into user friendly, streamlined, interfaces. This Project also exploits advances in the application of game theory to explore hypothetical operational scenarios that inform mission planning. These technologies will optimize mission command and network capabilities to fully realize AI on the battlefield.

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

Research in this Project supports Program Executive Office (PEO) Command Control Communications-Tactical (C3T).

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: AI-Enhanced Battle Damage Assessment	-	-	0.777
Description: Will mature and demonstrate game theory-based sensor-to-shooter optimization to assign available sensors to assess effects based on target and engagement type (target acquisition to terminal effects) and incorporate the capabilities into aided target recognition using mobile cooperative autonomous sensors (ATR-MCAS) and Prometheus. ATR-MCAS utilizes data from multiple sensors and artificial intelligence technology to identify threat targets for engagement with various weapons systems. Prometheus is a system that utilizes artificial intelligence (AI) technologies to identify targets of interest from overhead satellite images.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603040A / <i>Artificial Intelligence and Machine Learning Advanced Technologies</i>	Project (Number/Name) DA7 / <i>AI-Enabled Command and Coordination Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
ATR-MCAS and Prometheus technologies will be improved to provide additional, autonomous sensor options that can be used to identify threats and then assess effects based on the target and engagement type. This represents the simplest form of the sensor to shooter problem and will be used as a foundation for AI-enhanced operational maneuver.				
FY 2022 to FY 2023 Increase/Decrease Statement: This is a new start in FY23.				
Accomplishments/Planned Programs Subtotals		-	-	0.777
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence Advanced Technology
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	17.743	45.463	-	45.463	50.805	83.081	88.320	88.297	0.000	373.709
CL9: Collab Battlefield Networked Leth Sys Adv Tech	-	-	8.871	12.365	-	12.365	-	-	-	-	0.000	21.236
CM2: Collaborative Convergence Adv Tech Development	-	-	0.444	5.182	-	5.182	4.652	19.394	20.016	20.011	0.000	69.699
CM8: Convergence Battlefield Integration	-	-	8.428	9.162	-	9.162	26.912	43.214	47.825	47.812	0.000	183.353
DA4: All Domain Convergence Engineering & Architectures	-	-	-	18.754	-	18.754	19.241	20.473	20.479	20.474	0.000	99.421

Note

Project DA4 (All Domain Convergence Engineering & Architectures) is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

The Program Element (PE) executes research as part of a campaign of learning to assess feasibility of technologies in an operational environment, learning from early failure and re-scope research to improve speed of response, scalability, interoperability and range of engagement. This program element will deliver integration of technologies from sensor to shooter in near real-time, from tactical to strategic level, taking a system design approach in support of All Domain Situational Awareness (CJADC2). It will enable optimal lethal and non-lethal effects across all domains using artificial intelligence and machine learning to improve how we recognize threats, augment and enhance leader decision-making, replicate tactical behaviors to enable autonomous capabilities, and design system engineering architectures to validate interoperability of technologies.

Work in this PE complements PE 0603465A (Future Vertical Lift Advanced Technology) and PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

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

Research is performed by the United States Army Futures Command.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603041A / <i>All Domain Convergence Advanced Technology</i>
---	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	17.743	0.000	-	0.000
Current President's Budget	0.000	17.743	45.463	-	45.463
Total Adjustments	0.000	0.000	45.463	-	45.463
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	45.463	-	45.463

Change Summary Explanation

FY23 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology				Project (Number/Name) CL9 / Collab Battlefield Networked Leth Sys Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CL9: Collab Battlefield Networked Leth Sys Adv Tech	-	-	8.871	12.365	-	12.365	-	-	-	-	0.000	21.236
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates dynamic Weapon-Target Pairing (WTP) fires planning and execution for maneuver forces, integration of fires and intelligence technologies, Artificial Intelligence (AI)-based decision aid implementation, and integration & demonstration of a role-based networked lethality architecture.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project supports Next Generation Combat Vehicle, Tactical Network, Future Vertical Lift, and Long Range Precision Fires Army Modernization Priorities.

Research in this Project is done in coordination with Program Element (PE) 0602181A (All Domain Convergence Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Distributed Lethality Architecture	-	3.170	3.731
Description: This effort provides a decision aid architecture that will integrate with current and future sensors and weapon systems to network fires for a mounted/dismounted and tactical operation center capability for Combined Arms Maneuvers. Matures and demonstrates distributed architecture and data transmission for sensor to shooter to optimize effects-based WTP.			
FY 2022 Plans: Will develop a fires and air space coordination systems to support AI-based decision aids in a networked lethality architecture. Will provide AI-enhanced digital collaborative targeting capability, air space and fires de-confliction, as well as fires planning, coordination and delivery to reduce sensor to shooter timelines.			
FY 2023 Plans: Will mature fires and air space coordination systems that demonstrate four-dimension (4-D) de-confliction and speed of assets for effects delivery using decision aids for air and ground assets. Will mature AI-enhanced capability trained on terrain and ballistic data to include speed of platform. Will demonstrate distributed architecture and optimized weapon target pairing capability to reduce sensor to shooter timelines.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology	Project (Number/Name) CL9 / Collab Battlefield Networked Leth Sys Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Program funding increase is part of planned efforts to mature and demonstrate the integrated decision aid architecture capability.			
<p>Title: Integrated Sensor to Shooter System</p> <p>Description: Demonstrates software that ingests intelligence, sensor cueing, tasking and target hand off data from/to higher and lower echelons for sensor to shooter integration. Integrates software on combat platforms to enable on-board sensor and weapon systems to execute fires missions based on decision aids' recommendations with minimal operator input.</p> <p>FY 2022 Plans: Will integrate CBNLS with intelligence systems for theatre-net centric geolocation data while tying current and emerging weapons to execute fires at the tactical edge. Support demonstrations with Army's system of systems joint fires architecture to enable multi-domain fires.</p> <p>FY 2023 Plans: Will mature integration with intelligence systems and current and emerging weapons systems and platforms for Fires execution at the tactical, operational and strategic levels. Will demonstrate integration with joint fires architecture enabling multi-domain fires. Will demonstrate role-based software running on combat platforms to joint Tactical Operations Center (TOC) at scale, to enable Warfighters' fires and effects based on decision aids' recommendations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>	-	3.372	3.592
<p>Title: Fires Synchronization</p> <p>Description: Provides real-time, joint airspace integration between airspace users and fires at various echelons to de-conflict airspace for emerging long range munitions. Matures and demonstrates algorithms for modeling adversary behavior for autonomous engagement using prior knowledge and real-time sensor data.</p> <p>FY 2022 Plans: Will forecast future threat positions using advanced AI algorithms to identify the optimal required airspace to be coordinated based on available long range fires for a large number of nodes and distributed entities. These AI algorithms will provide potential courses of action using reinforcement learning, intuitive role based human-machine interfaces as well as game theory based algorithms for larger data sets.</p> <p>FY 2023 Plans: Will demonstrate direct/indirect joint fires planning and course of action analysis and provide multiple recommendations to the commander based on enemy common operating picture and friendly assets. Will mature AI-enhanced algorithms capability to</p>	-	2.005	5.042

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / <i>All Domain Convergence A dvanced Technology</i>	Project (Number/Name) CL9 / <i>Collab Battlefield Networked Leth Sys Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
execute Fires synchronization for an increased number of nodes. Will mature algorithms for modeling adversary behaviors for autonomous engagements. FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects increased effort on the synchronization of fires and execution of autonomous engagements.			
Title: SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.324	-
Accomplishments/Planned Programs Subtotals	-	8.871	12.365

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks N/A
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology				Project (Number/Name) CM2 / Collaborative Convergence Adv Tech Development			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CM2: Collaborative Convergence Adv Tech Development	-	-	0.444	5.182	-	5.182	4.652	19.394	20.016	20.011	0.000	69.699
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and integrates critical Project Convergence technologies and the architecture through which the Project Convergence technologies will operate. This is accomplished using adaptive data fusion and task allocation algorithm to support the development of Artificial Intelligence (AI) decision support agents. This Project includes development of advanced methods for processing and information extraction for mission oriented tasks in support of tactical decision makers. Additionally, this Project will develop the scalable architecture solutions necessary to facilitate tactical data collection, movement, processing, storage and modeling and simulation necessary to enable mission command in multi-domain operations. Also, the Project will shape early programs to accelerate technologies and achieve sensor to shooter dominance.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project supports Next Generation Combat Vehicle, Long Range Precision Fires, Air and Missile Defense, Tactical Network, and Future Vertical Lift Army Modernization Priorities.

Research in this Project is done in coordination with Program Element (PE) 0602181A (All Domain Convergence Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Air and Missile Defense Joint Kill Chain Decision Support Modeling and Simulation	-	0.428	-
Description: Demonstrate interoperability of missile interceptor, sensor, and fire control enabling technology contribution to Joint Kill Chain Air and Missile Defense scenarios in support of Multi-Domain Operations (MDO).			
FY 2022 Plans: Will demonstrate enabling missile technology in user defined Joint Kill Chain Air and Missile Defense scenarios by employing high fidelity models within the integrated air and missile defense simulation architecture.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology	Project (Number/Name) CM2 / Collaborative Convergence Adv Tech Development

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding in this effort is realigned to the task Joint Kill Web Experimentation within this same Project.			
<p>Title: Effects in the Joint Kill Web</p> <p>Description: Virtually demonstrate kinetic and non-kinetic actions in a contested, Multi-Domain environment at all echelons. This effort seeks to ensure that the Army can readily contribute to the Joint Force in the land, air, maritime, cyber, space, and electromagnetic domains in an integrated and coordinated fashion.</p> <p>FY 2023 Plans: Integrate, demonstrate and conduct virtual experimentation on the effects of kinetic and non-kinetic effectors to support the Army's contribution to the Joint Kill Chain. This effort will be coordinated with the Defense Advanced Research Project Agency as part of a multi-service effort.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase in funding is required to experiment and virtually demonstrate complicated joint warfighting concepts in an All-Domain environment.</p>	-	-	5.182
<p>Title: SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.016	-
Accomplishments/Planned Programs Subtotals	-	0.444	5.182

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology				Project (Number/Name) CM8 / Convergence Battlefield Integration			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CM8: <i>Convergence Battlefield Integration</i>	-	-	8.428	9.162	-	9.162	26.912	43.214	47.825	47.812	0.000	183.353
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project integrates and demonstrates aided target detection and recognition, autonomous tactical behaviors, Artificial Intelligence (AI)-enabled decision support agent, and data management technologies in Multi-Domain Operations (MDO) field experiments. This Project integrates these technologies on tactical ground, air, air and missile defense, fires, network platforms and other missions to demonstrate reduced sensor to shooter timelines and evaluate operational performance in representative MDO scenarios during annual field experiments.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project supports Next Generation Combat Vehicle, Tactical Network, and Future Vertical Lift Army Modernization Priorities.

Research in this Project is done in coordination with Program Element (PE) 0602181A (All Domain Convergence Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Convergence Ground Platform System Integration	-	6.063	5.639
Description: Integration of ground efforts in direct support of maturing and demonstrating Project Convergence capabilities. This effort matures and demonstrates ground vehicle technologies as an integrated system and system of systems to reduce sensor to shooter targeting time, increase real-time battlefield understanding and ensure communications across all echelons.			
FY 2022 Plans: Will develop Convergence integration and assessment capability with networked aided target detection and recognition, autonomous tactical behaviors, AI-enabled decision support agent, and data management technologies on multiple ground platforms. Will also mature and demonstrate ground vehicle integration, multi-platform network communication and perform analytics to inform requirements for both present and future tactical and combat military vehicles against a complex enemy in an MDO environment.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / <i>All Domain Convergence A dvanced Technology</i>	Project (Number/Name) CM8 / <i>Convergence Battlefield Integration</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will develop integration and assessment capability with networked aided target detection and recognition, autonomous tactical behaviors, AI-enabled decision support agent, and data management technologies on multiple ground platforms. Will mature and demonstrate additional ground vehicle integration, multi-platform, multi-service, multi-national network communication and perform analytics to inform requirements for both present and future tactical and combat military vehicles against a complex moving enemy in an MDO environment.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decrease due to leveraging integration efforts from previous year.</p>				
<p>Title: Convergence Aviation Platform Integration</p> <p>Description: Integration of Aviation/Future Vertical Lift efforts in direct support of maturing and demonstrating Project Convergence capabilities. Focus is on integration of capabilities such as geo-location and identification of targets from Army aviation assets, air to ground situational awareness and target data exchange, exchange of unmanned asset control, advanced tactical and teaming behaviors, synchronized data management, and efficient usage of air lethality assets.</p> <p>FY 2022 Plans: Will integrate individual capabilities developed under Full Spectrum Targeting effort (detection, recognition and identification of hidden and decoy targets, sensor fusion), multiple simultaneous engagement technologies (MSET) to engage targets autonomously, Advanced Teaming (supervised autonomous mission commands, various payloads), XM915 20 mm cannon, and Integrated Mission Equipment (platform-agnostic architecture for various science and technology (S&T) efforts integrated with each other) in support of Project Convergence (PC) capability demonstrations. Will select for integration from listed efforts based on technology maturity and applicability to overall PC kill chain scenarios in the demonstration.</p> <p>FY 2023 Plans: Will integrate additional and updated capabilities developed under Full Spectrum Targeting effort (detection, recognition and identification of hidden and decoy targets, sensor fusion), MSET to engage targets autonomously, Advanced Teaming (supervised autonomous mission commands, various payloads), XM915 20mm cannon, and Integrated Mission Equipment (platform-agnostic architecture for S&T efforts integrated with each other) in support of capability demonstrations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase in funding allows for additional capabilities to be validated and integrated onto the platforms in preparation for PC23.</p>		-	2.057	2.487
<p>Title: Convergence Joint and Multinational Integration</p> <p>Description: Integration with Joint and Multi-National Partner technologies to demonstrate cross domain capabilities and concepts.</p>		-	-	1.036

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology	Project (Number/Name) CM8 / Convergence Battlefield Integration

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>FY 2023 Plans: Integrate technologies and data architectures between Army, Joint, and Multi-National Partners.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase in funds necessary to ensure that technologies can be seamlessly integrated with sister Services and international partners for demonstration in Project Convergence.</p>			
<p>Title: SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.308	-
Accomplishments/Planned Programs Subtotals	-	8.428	9.162

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A dvanced Technology				Project (Number/Name) DA4 / All Domain Convergence Engineering & Architectures			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DA4: All Domain Convergence Engineering & Architectures	-	-	-	18.754	-	18.754	19.241	20.473	20.479	20.474	0.000	99.421
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project enables critical engineering and architecture support to all Army modernization priorities as the Army pursues convergence. Full development of mature system and system of systems level architectures ensure objective and data-driven analyses can be performed on new Army technologies and modernization efforts. Development of digital engineering products for new Army technologies currently under development enable digital analyses and assessments to be performed rapidly and repeatedly prior to full scale field tests like Project Convergence.

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

Research is performed by the United States (U.S.) Army Futures Command and subordinate organizations.

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

	FY 2021	FY 2022	FY 2023
Title: Engineering for Architectures	-	-	13.754
Description: The engineering and architecture project provides critical systems engineering and codesigning of systems at the design phase in a digital engineering environment to improve performance and integration. This includes development and integration of architecture and engineering products from system level to a full system of systems level, models and simulations, software engineering, and other key efforts to support senior leader decisions.			
FY 2023 Plans: Will integrate system and system of system level architectures to represent current design of the Army Modernization Priority systems in a model-based architecture to conduct analysis on how systems within the six Army Modernization Priorities provide an integrated solution in Multi-Domain Operations. Will perform analysis through modeling and simulation to inform Project Convergence and generate design engineering artifacts to inform the development of systems.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A dvanced Technology	Project (Number/Name) DA4 / All Domain Convergence Engineering & Architectures

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
This Project is a new start for FY23.			
<p>Title: Technology Integration Analysis for Army Modernization Priorities</p> <p>Description: Conduct independent assessments of the feasibility, scalability and interoperability of technologies evaluated in an all-domain convergence environment. Primary focus will be to develop and assess architectures, develop models and simulations to support trade studies and decision making across the Army Modernization Priority technologies, and evaluation of planned demonstration efficacy.</p> <p>FY 2023 Plans: Will conduct independent assessments of modernization priorities, Project Convergence planning support, senior leader directed studies, and M&S development in support of modernization priorities and Project Convergence.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This Project is a new start for FY23.</p>	-	-	2.000
<p>Title: Army Capability Architecture Development and Integration Environment (ArCADIE)</p> <p>Description: ArCADIE will develop and demonstrate the Army's authoritative cloud-based data source for Army Architectures, data and tools. This effort develops ArCADIE enhancements, architectures, and dashboards to enable experimentation, capability development, and S&T efforts in support of Army modernization.</p> <p>FY 2023 Plans: Will enhance the classified and unclassified cloud-based environment providing architecture development and analytical capabilities to ensure relevant and timely data and artifacts as part of Model Based Systems Engineering efforts to support integration across Army Modernization Priorities. Will develop intelligent graphical interfaces that allow visibility of integrated architecture data and artifacts to support Model Based Systems Engineering.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This Project is a new start for FY23.</p>	-	-	3.000
Accomplishments/Planned Programs Subtotals	-	-	18.754

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

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603041A / All Domain Convergence A Advanced Technology	Project (Number/Name) DA4 / All Domain Convergence Engineering & Architectures

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603042A / <i>C3I Advanced Technology</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	3.151	12.716	-	12.716	16.409	23.092	17.152	16.837	0.000	89.357
CN3: <i>Network Enabling University Adv Development</i>	-	-	3.151	3.993	-	3.993	4.013	3.902	3.564	3.563	0.000	22.186
CX7: <i>Intelligent Env Battlefield Awareness Adv Tech</i>	-	-	-	4.892	-	4.892	6.368	10.601	7.528	3.883	0.000	33.272
CX8: <i>Persistent Geophysical Sensing-Infrasound Adv Tech</i>	-	-	-	2.334	-	2.334	2.623	3.113	2.068	2.587	0.000	12.725
CX9: <i>Sensing in Contested Environments Adv Technologies</i>	-	-	-	1.082	-	1.082	1.099	2.067	-	-	0.000	4.248
CZ5: <i>Subterranean Detection and Monitoring Adv Tech</i>	-	-	-	0.415	-	0.415	1.266	1.421	1.421	1.919	0.000	6.442
DB5: <i>Enabling Long Standoff 3D (ELS3D) Adv Tech*</i>	-	-	-	-	-	-	1.040	1.988	2.571	4.885	0.000	10.484

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures, demonstrates, optimizes, and validates Network Command, Control, Communications, and Intelligence (C3I) technologies through the integration of future equipment and systems that improve overmatch and meet mission needs in the future operating environments. This PE provides mid-to-long term tactical C3I capabilities (e.g. networking, cyber, electronic warfare, Positioning, Navigation, and Timing (PNT), space, persistent surveillance) based upon promising technologies that address emerging and future threats, and includes research critical and unique to the Army and DoD. Efforts focus on advanced maturation and demonstration of materials, technologies, methodologies and systems that span the range from electronics, protective technologies, electronic warfare, and mission support capabilities such as situational awareness. These efforts directly inform and transition key capabilities to Army programs of record that support the Army modernization priorities.

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603042A / <i>C3I Advanced Technology</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	3.151	0.000	-	0.000
Current President's Budget	0.000	3.151	12.716	-	12.716
Total Adjustments	0.000	0.000	12.716	-	12.716
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	12.716	-	12.716

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology				Project (Number/Name) CN3 / Network Enabling University Adv Development			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CN3: <i>Network Enabling University Adv Development</i>	-	-	3.151	3.993	-	3.993	4.013	3.902	3.564	3.563	0.000	22.186
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced Network Command, Control, Communications, and Intelligence (C3I) technologies into future equipment and systems.

This Project accelerates advanced technologies originating from extramural research in academia, will enable intelligent networks, self-sensing/self-healing network, network security, advanced teaming and operations in a Global Positioning System (GPS) degraded or denied environment. This Project also accelerates the Army modernization in next generation Network and Assured Positioning, Navigation, and Timing (APNT) systems.

Research in this Project will lead to emerging technologies in areas of strategic importance to the Army in communications and networking, by engaging competitively selected Universities.

Research in this Project complements Program Element (PE) 0602182A (C3I Applied Research) / Project CN4 (Network Enabling University Applied Research).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Intelligent, Secure and Self-Sensing/Self-Healing Networks	-	0.361	0.400
Description: Mature and integrate advanced intelligent network solutions with autonomous or self-sensing intelligence to deny corruption, and/or attacks and to execute operational missions securely and reliably.			
FY 2022 Plans: Will mature, demonstrate and integrate advanced capabilities in AI/ML, predictive analytics, cyber, intelligent data integration, edge computer processing platforms, edge sensing systems, space or persistent surveillance applications and other technologies; optimize and demonstrate distributed learning under privacy and resource constraints and their communication between computing nodes and edge computing AI/ML solutions for network-driven intelligence; demonstrate intelligent multi-modal			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / <i>C3I Advanced Technology</i>	Project (Number/Name) CN3 / <i>Network Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
communications with improved reliability, efficiency, localization and effectiveness; and integrate sensor technologies (biometric and biosensor solutions) for intelligent network credentialing and access. FY 2023 Plans: Will continue maturation of artificial intelligence and machine learning (AI/ML) software for Network technologies, predictive analytics software, intelligent data integration software, edge computer processing platforms, edge sensing systems, and other technologies; Will demonstrate these algorithms on simulator software built to emulate tactical networks using the network topologies and positions that are produced in on-field situations, as well as Army experimental platform/devices. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.				
Title: Advanced Real-Time Tactical Networks Description: Develop tactical network technology platforms consisting of a fleet of ground and air vehicles that will perform an autonomous reconnaissance mission in a relevant environment. FY 2022 Plans: Will develop, demonstrate and integrate Artificial Intelligence/Machine Learning Autonomy-related algorithms with improved holistic network functionalities to support advanced navigation/routing and autonomous reconnaissance mission. Will use shared perception and situational awareness for collaborative Ground and Air autonomous systems, and advanced teaming operations in uncertain environments and challenging situations; and integrate mature technologies with/to experimental Ground and Air platforms for accelerated development and prototyping. FY 2023 Plans: Will continue to develop, and integrate Artificial Intelligence/Machine Learning Autonomy-related algorithms with improved holistic network functionalities, overlay for reliably supporting tactical cyberphysical systems over unreliable communication and computation networks for advanced teaming operations. Will demonstrate cache network with information reuse across components and continue to integrate mature technologies with/to experimental Ground and Air platforms for accelerated development and prototyping. Will mature algorithms for collaborative RF sensing and inference for distributed tactical networks and demonstrate on Army network testbeds. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.		-	1.262	1.300
Title: Advanced Sensors and Non-GPS PNT Systems		-	1.413	2.293

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology	Project (Number/Name) CN3 / Network Enabling University Adv Development

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: Develop advanced sensors with enhanced signal processing software/algorithms to improve assurance against both electronic and kinetic attacks relative to GPS, and that can provide matured Positioning, Navigation and Timing (PNT) technology in disrupted, degraded or denied Global Positioning System (GPS) environments.</p> <p>FY 2022 Plans: Will design, fabricate, and integrate GPS signal integrity monitoring sensors and reporting systems to enhance Soldier awareness in disrupted, degraded or denied GPS environments; and develop, mature, demonstrate, and integrate technologies involving atomic timing modules, advanced vision, radar, or other Global Navigation Satellite System (GNSS)-independent PNT solutions that are computationally and physically lightweight.</p> <p>FY 2023 Plans: Will continue to design, fabricate, and integrate GPS signal integrity monitoring global and tactical sensors and reporting systems to enhance Soldier awareness in disrupted, degraded or denied GPS environments and inform regarding local threat emitter detection, characterization and geolocation. Will mitigate effects of threats on Soldier PNT solution.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase will support the development and integration of integrity monitoring tactical sensors and to mitigate the effects of threat on Soldier PNT solutions.</p>			
<p>Title: SBIR/STTR Transfer</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC 2638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 2638</p>	-	0.115	-
Accomplishments/Planned Programs Subtotals	-	3.151	3.993

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology				Project (Number/Name) CX7 / Intelligent Env Battlefield Awareness Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CX7: Intelligent Env Battlefield Awareness Adv Tech</i>	-	-	-	4.892	-	4.892	6.368	10.601	7.528	3.883	0.000	33.272
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is realigned from Program Element (PE) 0603463A (Network C3I Advanced Technology) Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).

A. Mission Description and Budget Item Justification

This Project optimizes and demonstrates technologies to allow Soldiers to maneuver faster around or through existing environmental (urban/industrial) conditions and physical landscape constraints. This effort matures and demonstrates web modules/software tools delivering crucial geo-chemical resources and advanced knowledge of geo-environmental infrastructure to mission planners. This Project delivers critical technologies that provide situational awareness for multi-source intelligence, particularly for anti-access/area denied (A2/AD) outside the continental United States (OCONUS) sites.

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

Research is performed at the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This research complements Program Element (PE) 0602182A (C3I Applied Research) / Project CX3 (Intelligent Env Battlefield Awareness Apl Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Arctic Threats Demonstrations	-	-	1.123
Description: This effort matures and demonstrates visualization tools which enable geospatial decisions based on anticipated physical threats, hazards and dependencies posed by terrain and weather extremes in cold regions.			
FY 2023 Plans: Will integrate weather models into high resolution remotely sensed terrain data platform demonstrating terrain state changes such as freeze/thaw, snowmelt, and ice vulnerability to aid in preventing risks to operational effectiveness and efficiency in cold regions.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Advanced Technology) / Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).			
Title: Geo-Forensics for Reconnaissance Exploitation	-	-	1.022

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology	Project (Number/Name) CX7 / Intelligent Env Battlefield Awareness Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: This effort provides unique terrestrial patterns to describe and predict the geological, biological, and overall ecological information associated with anti-access/area denial (A2/AD) sites from the continental United States (CONUS) analogs.</p> <p>FY 2023 Plans: Will demonstrate geospatial platform implementation of geo-forensic predictive framework to geo-locate unknown soil samples and predict soil provenance.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Advanced Technology) / Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).</p>			
<p>Title: Predictive Geographic Information Systems (GIS) Mapping (physical) Demonstration</p> <p>Description: This effort reduces the impact of unknown and changing terrain conditions by automating the integration of disparate datasets and overlays of terrain obstacles producing a high-fidelity map that integrates soil composition, vegetation, hydrology, and permafrost/ice data.</p> <p>FY 2023 Plans: Will prototype, validate, and integrate geospatial tools describing geophysical models in a unified geospatial framework.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Advanced Technology) / Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).</p>	-	-	1.646
<p>Title: Hydrology Mapping Demonstrations</p> <p>Description: This effort matures and demonstrates data tools and models to support high-fidelity battlefield overlay maps that accurately show hydrologic/soil moisture threats (soil, hydrology, and snow/ice) not captured by current terrain mapping capabilities.</p> <p>FY 2023 Plans: Will demonstrate existing hydrologic and watershed tools and integrate applied research products (data, models, and algorithms) in the Predictive GIS platform.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Advanced Technology) / Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).</p>	-	-	0.491
<p>Title: Vegetation Property Demonstrations</p>	-	-	0.610

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / <i>C3I Advanced Technology</i>	Project (Number/Name) CX7 / <i>Intelligent Env Battlefield Awareness Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: Funding is realigned from PE 0603463A Project AR6 (Understanding the Environment as a Threat Adv Tech).</p> <p>FY 2023 Plans: Will generate datasets and demonstrate models that identify global-scale forest ecotones that inform regional planning.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Advanced Technology) / Project AR4 (Intelligent Env Battlefield Awareness Adv Tech).</p>			
Accomplishments/Planned Programs Subtotals	-	-	4.892

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology				Project (Number/Name) CX8 / Persistent Geophysical Sensing-Infrasound Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CX8: Persistent Geophysical Sensing-Infrasound Adv Tech	-	-	-	2.334	-	2.334	2.623	3.113	2.068	2.587	0.000	12.725
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned from Program Element (PE) 0603463A (Network C3I Technology) / Project AS9 (Persistent Geophysical Sensing-Infrasound Adv Tech).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates kitted hardware and software solutions that persistently monitor (through non-line-of-sight sensing including infrasound) critical infrastructure conditions and threat activities in dynamic battlefields. These technologies provide near real time data collection, processing, and alerts of infrastructure go/no-go condition required for maneuver planning. This Project also matures and demonstrates methodologies to assign maneuver relevant engineering attributes to geospatial feature data such as bridge load classification, road condition, and bathymetry. These technologies are critical to providing increased situational awareness leading to faster decision making and informing battlefield and maneuver operations.

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

Research is performed at the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This research complements PE 0603042A (C3I Applied Research) / Project CX4 (Persistent Geophysical Sensing-Infrasound Apl Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Battlefield Intelligence by Geophysical Sensing (BIGS) Demonstration	-	-	2.334
Description: This effort matures and demonstrates geophysical and geo-sensing technologies to persistently assess battlefield elements to include infrastructure (algorithm refinements) and additional sources of interest, such as explosive and fires events and various threats. Optimization of the array sensors and geometry to improve array performance for new sources of interest while reducing logistics will also be matured and demonstrated. New detection and classification signal processing algorithms will be validated throughout the life of the task in a phased demonstration schedule.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology	Project (Number/Name) CX8 / Persistent Geophysical Sensing-Infrasound Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Will validate and demonstrate classification algorithms of sources of interest as determined by stakeholders and provide software updates; Will utilize a military user assessment to evaluate alternate array geometry for feedback loop. FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0603463A (Network C3I Technology) / Project AS9 (Persistent Geophysical Sensing-Infrasound Adv Tech).			
Accomplishments/Planned Programs Subtotals	-	-	2.334

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology				Project (Number/Name) CX9 / Sensing in Contested Environments Adv Technologies			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CX9: Sensing in Contested Environments Adv Technologies	-	-	-	1.082	-	1.082	1.099	2.067	-	-	0.000	4.248
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2023, this Project is realigned from Program Element (PE) 0603463A (Network C3I Advanced Technology) Project AR8 (Sensing in Contested Environments Adv Tech).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced sensor technologies that characterize hazards posed to warfighters by non-weaponized biological hazards in subterranean environments. Demonstrations of adaptive commercial off the shelf sensor technologies on existing unmanned ground vehicles (UGV) platforms to gather end-user feedback. The capabilities resulting from this project provide Soldiers the capability to understand biological hazards present in subterranean environments and take necessary steps to mitigate or avoid these threats.

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

Work is performed at the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This work complements PE 0602182A (C3I Applied Technology) Project CX5 (Sensing in Contested Environments Technologies).

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

	FY 2021	FY 2022	FY 2023
Title: Non-traditional Threat Detection in Contested Environments Tech	-	-	1.082
Description: This effort identifies, examines, prioritizes, and exploits commercial of the shelf capabilities from multiple sources that can accurately detect biological and water quality hazards relevant to operations in subterranean environments from point of ingress/egress to evaluate exposure potential and affects.			
FY 2023 Plans: Will demonstrate a new sensor with the ability to detect 1-3 macroscopic organisms; Will also evaluate field-ready COTS sensors that utilize polymerase chain reaction (PCR) and DNA sequence technologies to accurately detect biological hazards.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / <i>C3I Advanced Technology</i>	Project (Number/Name) <i>CX9 I Sensing in Contested Environments Adv Technologies</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding realigned from PE 0603463A (Network C3I Advanced Technology) Project AR8 (Sensing in Contested Environments Adv Tech).			
Accomplishments/Planned Programs Subtotals	-	-	1.082

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology				Project (Number/Name) CZ5 / Subterranean Detection and Monitoring Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CZ5: Subterranean Detection and Monitoring Adv Tech</i>	-	-	-	0.415	-	0.415	1.266	1.421	1.421	1.919	0.000	6.442
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is realigned from Program Element (PE) 0603463A (Network C3I Advanced Technology) / Project AT3 (Subterranean Detection and Monitoring Adv Tech).

A. Mission Description and Budget Item Justification

This Project validates and demonstrates advanced subterranean monitoring and vulnerability assessment technologies providing mobile and man-portable solutions to enhance survivability and threat awareness during urban operations and negate enemy subterranean operation advantage. This Project also optimizes and demonstrates enhanced technologies to detect tunnels and tunneling activity in complex and varied environments. These capabilities are critical to provide greater situational awareness of the subterranean domain and enhanced survivability for the Soldier.

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

Research is performed at the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This research complements PE 0602182A (Network C3I Enabling Technologies) / Project CX6 (Subterranean Detection and Monitoring Apl Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Cavity Assessment in Variable Environments-Subterranean (CAVES) Demonstrations	-	-	0.415
Description: This effort validates and demonstrates an integrated suite of tunnel detection and perimeter security systems for application in variable terrain, and complex geologic environments, such as mountains, and hard rock geology common in the western pacific.			
FY 2023 Plans: Will validate which legacy tunnel detection systems will be evaluated in demonstrations in FY24 in hard rock geology.			
FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year 2023, funding realigned from Program Element 0603463A (Network C3I Advanced Technology) / Project AT3 (Subterranean Detection and Monitoring Adv Tech).			
Accomplishments/Planned Programs Subtotals	-	-	0.415

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603042A / C3I Advanced Technology	Project (Number/Name) CZ5 / Subterranean Detection and Monitoring Adv Tech

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	0.754	17.946	-	17.946	18.557	20.486	17.036	15.635	0.000	90.414
CL4: Air Platform Enabling University Adv Development	-	-	0.754	1.251	-	1.251	1.361	1.455	1.157	1.157	0.000	7.135
CV1: Control & Autonomy for Tactical Superiority Adv	-	-	-	1.140	-	1.140	1.248	1.247	1.144	1.143	0.000	5.922
CV2: Structures Platform Int Resilience & Efficiency	-	-	-	3.124	-	3.124	3.343	5.109	6.507	5.110	0.000	23.193
CX1: Advanced Rotors Advanced Tech	-	-	-	2.618	-	2.618	2.645	2.669	2.670	2.669	0.000	13.271
CX2: Next Generation Aviation Transmission Adv Tech	-	-	-	4.389	-	4.389	4.455	4.450	-	-	0.000	13.294
DC3: HPC For Army Aviation Concepts	-	-	-	5.424	-	5.424	5.505	5.556	5.558	5.556	0.000	27.599

Note

In Fiscal Year 2023 (FY23), Project CV1 (Control & Autonomy for Tactical Superiority Adv) and Project CV2 (Structures Platform Int Resilience & Efficiency) are New Start Projects.

Project CX1 (Advanced Rotors Advanced Tech) is a realignment from Program element (PE) 0603465A (Future Vertical Lift Advanced Technology) / Project AJ7 (Advanced Rotors Advanced Technology).

Project CX2 (Next Generation Aviation Transmission Adv Tech) is a realignment from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AJ3 (Next Generation Rotorcraft Transmission Adv Tech).

Project DC3 (HPC For Army Aviation Concepts) is a realignment from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AL3 (Next Generation Rotorcraft Transmission Adv Tech).

A. Mission Description and Budget Item Justification

This Program Element (PE) undertakes advanced technology efforts that support and enable the overall Army Aviation portfolio in general, and the Army's modernization priority for Future Vertical Lift (FVL). Vital and enduring research into advanced technologies is conducted pertinent to the air portfolio that supports mid-to-long

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603043A / <i>Air Platform Advanced Technology</i>
---	---

term requirements in contested operational environments and technologies that have broad application to FVL modernization, as well as overall Army and specific Department of Defense (DoD) aviation needs.

Research in this PE contributes to the Army Science and Technology (S&T) air systems portfolio and is fully coordinated with efforts in PE 0602148A (Future Vertical Lift Technology), PE 0603465A (Future Vertical Lift Advanced Technology) and PE 0602183A (Air Platform Applied Research).

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

Research in this PE is performed by the United States Army Futures Command (AFC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	0.754	0.000	-	0.000
Current President's Budget	0.000	0.754	17.946	-	17.946
Total Adjustments	0.000	0.000	17.946	-	17.946
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	17.946	-	17.946

Change Summary Explanation

FY23 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology				Project (Number/Name) CL4 / Air Platform Enabling University Adv Development			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CL4: Air Platform Enabling University Adv Development	-	-	0.754	1.251	-	1.251	1.361	1.455	1.157	1.157	0.000	7.135
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project focuses on experimentation and demonstration of advanced technologies originating from extramural applied research in academia pertaining to navigation/routing, autonomous robotic vehicles, artificial intelligence and machine learning as applied to aerial mobility and maneuver, holistic survivability, teaming, integrated mission systems, air-launched effects, and other innovative air enabling applied research technologies, that will accelerate the Army modernization in next generation aerial vehicles. This Project will mature and integrate advanced efforts to focus more on mid to far-term Army modernization priorities while also maintaining delivery of near-term technologies fundamental to the modernization priorities. This effort conducts and demonstrates advanced technology efforts arising from academic research in all areas of strategic importance to Army Aviation in artificial intelligence / machine learning (AI/ML), autonomous teaming systems, survivability, aeromechanics, advanced vertical take-off and landing (VTOL) design & concepts, flight dynamics, vibration & noise control, propulsion, human factor engineering and structures and materials, etc., by bringing competitively selected Universities with research and development teams into Technical Alliances. The Project will continuously experiment with methods to identify, demonstrate and transition novel technology from entities that might not otherwise collaborate with the Department of Defense (DoD), with the end goal of accelerating the adoption of cutting-edge applied research technology for the warfighter in the Army aviation portfolio.

Research in this Project supports the Army Modernization Priority Future Vertical Lift and the overall aviation portfolio.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is done in coordination with and transitions to Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) and PE 0603119A (Ground Advanced Technology), and is also coordinated with its sister project in PE 0602148A (Future Vertical Lift Technology) and PE 0602183A (Air Platform Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Teaming	-	0.320	-
Description: Demonstrate and integrate capabilities to self-organize and coordinate large teams of unmanned vehicles participating in long-term reconnaissance operation using distributed command/control architectures despite communication delays and/or failures and showcasing resilience to wide-area jamming.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) CL4 / Air Platform Enabling University Adv Development

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans: Will further mature and demonstrate decentralized self-organization AI/ML algorithms among large team of unmanned heterogeneous autonomous assets deployed inside contested environments that are robust to emerging threats, lost links, or change in mission priorities. Will integrate and provide decentralized interactions that will provide knowledge bases, reasoning, planning, sensing and control tools that reside inside the entire vehicle team and mobile computational resources. Will implement scalable approaches for perception to allow for rapid evaluation and recognition of previously detected landmarks</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Realigned funds to new task "Vertical Lift Advanced Technologies" in this Project.</p>			
<p>Title: Coordinated Air-Ground Vehicle Maneuvering</p> <p>Description: Demonstrate and integrate a technology prototype platform consisting of a fleet of ground and air vehicles that will perform an autonomous reconnaissance mission in a relevant environment.</p> <p>FY 2022 Plans: Will demonstrate level coordinated landing/take-off of unmanned aerial system from stationary platform near ground vehicle in simulations. Will further mature and deploy software for air-ground coordination software support autonomous reconnaissance. Will integrate and demonstrate coordination strategies for autonomous ground and air vehicles to perform tactical reconnaissance mission.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Realigned funds to new task "Vertical Lift Advanced Technologies" in this Project.</p>	-	0.407	-
<p>Title: Vertical Lift Advanced Technologies</p> <p>Description: Conduct advanced development within academia to mature and integrate Vertical Lift research of promising and emerging technologies.</p> <p>FY 2023 Plans: Will mature and integrate emerging technologies in areas of autonomous teaming systems, survivability, aeromechanics, advanced VTOL design & concepts, flight dynamics, vibration & noise control, propulsion, human factor engineering and structures & materials.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>	-	-	1.251

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) CL4 / Air Platform Enabling University Adv Development

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Combined tasks "Advanced Teaming" and "Coordinated Air-Ground Vehicle Maneuvering" from FY22 to "Vertical Lift Advanced Technologies"			
Title: SBIR/STTR Transfer	-	0.027	-
FY 2022 Plans: Funding transferred in accordance with Title 15 USC 2638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 2638			
Accomplishments/Planned Programs Subtotals	-	0.754	1.251

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) CV1 / Control & Autonomy for Tactical Superiority Adv
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CV1: Control & Autonomy for Tactical Superiority Adv	-	-	-	1.140	-	1.140	1.248	1.247	1.144	1.143	0.000	5.922
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project will deliver advanced flight controls, autonomy technologies, and new handling qualities criteria are implemented and tested in a realistic environment to demonstrate their functionality and increase their technical readiness level (TRL). This Project also delivers demonstrated and matured flight controls and autonomy technologies at TRL 6 to transition partners.

Research in this Project is fully coordinated with Program Element (PE) 0602183A (Air Platform Applied Technology).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Adaptive Tactical Autonomy and Control (ATAC) Technology Demonstration	-	-	1.140
Description: Mature, integrate, and demonstrate advanced flight control technologies and state-of-the-art autonomy algorithms that provide Future Vertical Lift (FVL) aircraft with enhanced maneuverability and agility, reduced cognitive workload, improved survivability through damage tolerance, and the ability to operate on an autonomy spectrum from piloted to fully autonomous and exploit degraded environments as a force multiplier.			
FY 2023 Plans: Will demonstrate advanced high-speed flight control algorithms within the flight-envelop-limits of Army flying laboratories. Will demonstrate control strategies for seamless hand-off from pilot to autonomous system, and back, for optionally piloted operations.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) CV1 / Control & Autonomy for Tactical Superiority Adv

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Will collaborate with the original equipment manufacturers (OEM?s) to mature and flight test new high-speed handling qualities criteria and Mission Task Elements (MTE). FY 2022 to FY 2023 Increase/Decrease Statement: This is a New Start in FY23.			
Accomplishments/Planned Programs Subtotals	-	-	1.140

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology				Project (Number/Name) CV2 / Structures Platform Int Resilience & Efficiency			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CV2: Structures Platform Int Resilience & Efficiency	-	-	-	3.124	-	3.124	3.343	5.109	6.507	5.110	0.000	23.193
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project will ensure a continuous stream of transition-ready critical structures advanced technologies for improvement of performance (via weight efficiency and multifunctionality for parasitic weight avoidance) and resilience (survivability, sustainment, and operational availability).

Research in this Project is fully coordinated with Program element (PE) 0602183A (Air Platform Applied Technology).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Adaptive Resilient Engineered Structures (ARES)	-	-	3.124
Description: Mature, integrate, and demonstrate advanced structures technologies providing performance, survivability, and sustainment benefits with broad applicability across platform scale and role, enabling mission success for manned/unmanned Future Vertical Lift (FVL) platforms in the contested environment of multi-domain operations.			
FY 2023 Plans: Will further mature, test, and integrate advanced structures technologies, quantifying their contribution to improved efficiency, performance, survivability, and sustainment (reliability and availability). Will leverage trade study results to design an integrated demonstration exploiting the synergy of technologies including weight-saving, fatigue-tolerant, affordable, multifunctional, and damage-tolerant configurations for primary and secondary structure.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) CV2 / Structures Platform Int Resilience & Efficiency

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
This is a New Start in FY23.			
Accomplishments/Planned Programs Subtotals	-	-	3.124

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology				Project (Number/Name) CX1 / Advanced Rotors Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CX1: Advanced Rotors Advanced Tech	-	-	-	2.618	-	2.618	2.645	2.669	2.670	2.669	0.000	13.271
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned from:
 Program Element (PE) 0603465A / Future Vertical Lift Advanced Technology
 * Project AJ7 / Advanced Rotors Advanced Technology

A. Mission Description and Budget Item Justification

This Project investigates Future Vertical Lift (FVL) and other Army and Department of Defense (DoD) advanced drive train technologies that increase performance and double current drivetrain life cycles while improving their reliability and maintainability.

Research in this Project is fully coordinated with PE 0602183A (Air Platform Applied Technology).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: High Speed Highly Efficient Rotors	-	-	2.618
Description: This effort demonstrates full scale, integrated rotor system technologies through the assessment of alternative designs aimed to satisfy future capability needs for aviation and FVL increased system durability, efficiency, speed, range, and payload. Potential technologies include: integrated high speed, low drag rotor technologies for high speed configurations; interactional aerodynamics tailoring between rotor and body & auxiliary lift/ propulsors; light weight, low volume, efficient and high authority electro-mechanical actuators (EMAs); reliable and robust actuators/hubs/controls for Independent Blade Control (IBC)/ swashplateless rotors; active/passive flow control; and automated track and balance.			
FY 2023 Plans: Will complete fabrication of demonstration hardware. Will conduct rotor blade and hub structural testing. Will conduct full scale whirl test planning.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / <i>Air Platform Advanced Technology</i>	Project (Number/Name) CX1 / <i>Advanced Rotors Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
In FY23 this effort is realigned from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AJ7 (Advanced Rotors Advanced Technology).			
Accomplishments/Planned Programs Subtotals	-	-	2.618

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology				Project (Number/Name) CX2 / Next Generation Aviation Transmission Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CX2: Next Generation Aviation Transmission Adv Tech</i>	-	-	-	4.389	-	4.389	4.455	4.450	-	-	0.000	13.294
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned from:
 Program Element (PE) 0603465A / Future Vertical Lift Advanced Technology
 * Project AJ3 / Next Generation Rotorcraft Transmission Adv Tech

A. Mission Description and Budget Item Justification

This Project develops and ground demonstrates variable-speed advanced transmission technologies that can be matured and integrated into the development of Future Vertical Lift (FVL) platforms and other Army and Department of Defense (DoD) aviation systems.

Research in this Project is fully coordinated with PE 0602183A (Air Platform Applied Technology).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: High Reduction Ratio Transmission (HRT)	-	-	4.389
Description: This effort will mature and demonstrate the technologies necessary for development, design, fabrication, and testing of a high reduction-ratio transmission in two stages or less (60:1 reduction ratio) with high efficiency and improved reliability against corrosion and seal leakage. Technology demonstrations from this effort will be applicable to FVL platforms.			
FY 2023 Plans: Will perform component level fabrication, assembly, and risk reduction testing of transmission technologies that produces a 60:1 reduction ratio two-stage gearbox design for significant weight and volume reduction enabling extended range and component life while improving reliability and reducing life-cycle costs for manned and unmanned applications.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / <i>Air Platform Advanced Technology</i>	Project (Number/Name) CX2 / <i>Next Generation Aviation Transmission Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
In FY23 this effort is realigned from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AJ3 (Next Generation Rotorcraft Transmission Adv Tech).			
Accomplishments/Planned Programs Subtotals	-	-	4.389

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology				Project (Number/Name) DC3 / HPC For Army Aviation Concepts			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DC3: HPC For Army Aviation Concepts	-	-	-	5.424	-	5.424	5.505	5.556	5.558	5.556	0.000	27.599
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23), this Project is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) / Project AL3 (HPC for Rotorcraft Applications Adv Tech).

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the use of high-fidelity computational fluid dynamics for Future Vertical Lift (FVL) platforms through the utilization of Department of Defense (DoD) High- Performance Computing (HPC) and software tools for cutting-edge modeling and simulation, as well as adding software capabilities for workflow automation and design space exploration. Efforts in this Project are also applicable to the family of FVL and Future Unmanned Aircraft System (FUAS) platforms.

Work in this Project is fully coordinated with PE 0602183A (Air Platform Applied Research).

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

Research is performed by the United States (US) Army Engineer Research and Development Center and coordinated with US Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Engineered Resilient Systems (ERS) for Army Aviation	-	-	2.359
Description: This effort supports Future Vertical Lift by exploiting advancements in physics-based software tools to provide rapid engineering analysis of proposed rotorcraft platforms, providing high-fidelity computational modeling of candidate Future Attack Reconnaissance Aircraft (FARA) platforms during the FARA down-selection, increasing the speed of simulations by automating simulation setup and execution on DoD HPC systems, and maturing and demonstrating the use of advanced machine learning techniques for aviation datasets to inform both the development of FVL systems and current operations.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603043A / Air Platform Advanced Technology	Project (Number/Name) DC3 / HPC For Army Aviation Concepts		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will provide automated tools and plugins to evaluators to support FARA / Future Long-Range Assault Platforms (FLRAA) design evaluations. Will expand computational modeling and optimization efforts to include additional domains, e.g., advanced rotor blade material and acoustic considerations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year (FY) 2023, this effort is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) / Project AL3 (HPC for Rotorcraft Applications Adv Tech).</p> <p>Title: Advanced Computational Technologies for Army Aviation</p> <p>Description: This effort supports FVL by utilizing advanced machine-assisted design algorithms to explore design spaces and choose resilient platform variants. Advanced computational techniques will leverage automated design processes to expand computational testbeds in support of testing and evaluation. Increase high accuracy physics in modeling and simulation to optimize platforms for all operational environments and mission scenarios. Provide multi-fidelity computational models of candidate FARA, FLRAA, and FTUAS platforms to support acquisition decision-makers.</p> <p>FY 2023 Plans: Will couple engineering design evaluation with simulated mission scenario performance for mission-effectiveness design evaluation. Will expand computational modeling capability to secret and/or above secured high-performance computing. Will evaluate the usability of physics-informed machine learning methods and approaches to impact design and analysis of rotorcraft systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year (FY) 2023, this effort is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) Project AL3 (HPC for Rotorcraft Applications Adv Tech).</p>		-	-	3.065
Accomplishments/Planned Programs Subtotals		-	-	5.424
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603044A / <i>Soldier Advanced Technology</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	0.890	0.479	-	0.479	1.208	3.891	4.131	3.921	0.000	14.520
CN8: <i>Soldier Enabled University Advanced Development</i>	-	-	0.890	0.479	-	0.479	0.584	2.852	2.779	2.778	0.000	10.362
CW1: <i>Technical-SAVVY Soldier Advanced Research*</i>	-	-	-	-	-	-	0.624	1.039	1.352	1.143	0.000	4.158

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures, optimizes, and validates applied research technologies to demonstrate improved capabilities and systems that advance Soldier and Squad lethality-overmatch and Soldier performance beyond those technologies planned within the Soldier Lethality Cross-Functional Team. Advanced technology research efforts focus on the maturation and integration of broad capabilities and systems that span a range of technical areas to address enduring Soldier needs. These efforts transition outputs to existing and emerging systems in support of continuing enhancement of Soldier capabilities. This PE will fund civilian salaries for in-house researchers/scientists and program managers collaborating with external subject matter experts in academia and industry who are leaders in these technology research areas.

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	0.890	0.000	-	0.000
Current President's Budget	0.000	0.890	0.479	-	0.479
Total Adjustments	0.000	0.000	0.479	-	0.479
• Congressional General Reductions	-	-	-	-	-
• Congressional Directed Reductions	-	-	-	-	-
• Congressional Rescissions	-	-	-	-	-
• Congressional Adds	-	-	-	-	-
• Congressional Directed Transfers	-	-	-	-	-
• Reprogrammings	-	-	-	-	-
• SBIR/STTR Transfer	-	-	-	-	-
• Adjustments to Budget Years	-	-	0.479	-	0.479

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity
2040: *Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)*

R-1 Program Element (Number/Name)
PE 0603044A / *Soldier Advanced Technology*

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603044A / <i>Soldier Advanced Technology</i>				Project (Number/Name) CN8 / <i>Soldier Enabled University Advanced Development</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CN8: <i>Soldier Enabled University Advanced Development</i>	-	-	0.890	0.479	-	0.479	0.584	2.852	2.779	2.778	0.000	10.362
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project leverages advanced technological innovations from academia to accelerate the optimization and demonstration of improved capabilities and systems that advance Soldier and Squad lethality-overmatch and Soldier performance and meet mission needs in the future operating environments. This Project funds collaborative, enduring advanced extramural university-based maturation and demonstration of technologies and brings together competitively selected universities with Army research teams into Technical Alliances. This Project will focus efforts on mid- to far-term Army modernization priorities while also maintaining delivery of near-term technologies critical to supporting the modernization priorities. The technical scope of this Project includes the optimization, maturation and demonstration of overarching Soldier-centric technologies including human systems integration, simplified synthetic training environments, advanced protective materials, power and energy, Warfighter endurance, robotics, as well as other innovative Soldier enabled advanced research technologies that will accelerate the Army modernization in Synthetic Training Environment, and Soldier Lethality. This Project conducts advanced research and development leading to potential emerging technologies in areas of strategic importance to the Army in Soldier capabilities related to increased protection, performance, agility, situational awareness, and lethality. This Project will also continuously strive to engage and collaborate with entities that might not otherwise collaborate with the Department of Defense (DoD) to demonstrate and provide novel Soldier-centric technologies for accelerating the adoption of emerging technologies for the Warfighter in the Army Soldier portfolio.

Research in this Project supports the Army Modernization Priorities of Synthetic Training Environment and Soldier Lethality, and the overall Soldier science and technology (S&T) portfolio.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project complements and supports transitions from Soldier Enabling University Applied Research in Program Element 0602184A (Soldier Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Soldier Performance and Training	-	0.574	0.479
Description: Mature and demonstrates Soldier capabilities related to increased protection, performance, agility, situational awareness, training, and lethality.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603044A / <i>Soldier Advanced Technology</i>	Project (Number/Name) CN8 / <i>Soldier Enabled University Advanced Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Further mature and integrate reliable monitoring and assessment technologies for the health and readiness of Warfighters through digital/wireless biomarkers and biosensors; comprehensive automated testing framework to guarantee that synthetic training environments are highly trustworthy, reliable, and usable.</p> <p><i>FY 2023 Plans:</i> Down-select, optimize, and validate with Soldier input mobile monitoring technologies, including digital/wireless biosensors, to identify conditions that might impede peak Soldier performance and enable Warfighter readiness.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding change reflects the realignments to Program Element (PE) 0603116A (Lethality Advanced Technology) / CG2 (Lethality Enabling University Adv Development).</p>				
<p><i>Title:</i> Soldier Advanced Materials for the Integrated Combat Platform</p> <p><i>Description:</i> Optimize and mature advanced materials and electronics that are standardized to the Soldier and their equipment through integrated combat platform.</p> <p><i>FY 2022 Plans:</i> Mature Soldier electronics technology and optimize server processing to enable real-time data/video analytics and faster target detection capabilities. Mature and demonstrate advanced materials, such as flexible, energy storage, self-healing and super materials, for increased protection, power, and wireless technology to further integrate with the Soldier and Squad combat platform.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding change reflects the realignments to PE 0603116A (Lethality Advanced Technology) / CG2 (Lethality Enabling University Adv Development).</p>		-	0.284	-
<p><i>Title:</i> SBIR/STTR Transfer</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>		-	0.032	-
Accomplishments/Planned Programs Subtotals		-	0.890	0.479

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603044A / <i>Soldier Advanced Technol ogy</i>	Project (Number/Name) CN8 / <i>Soldier Enabled University Advanced Development</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	26.711	26.508	-	-	-	0.000	0.000	0.000	0.000	0.000	53.219
EB3: <i>HIV Medical Development</i>	-	26.711	26.508	-	-	-	-	-	-	-	0.000	53.219

A. Mission Description and Budget Item Justification

This Program Element (PE) funds the Military Human Immunodeficiency Virus (HIV) Research Program and the following medical research efforts: Walter Reed Army Institute of Research (WRAIR) Vaccine Production research, Underbody Blast (UBB) research, and Deployed Warfighter Protection. Funding also supports the Medical Operational Data System (MODS), Pharmacovigilance Defense Application System (PVDAS), Mobile HealthCare Environment (MHCE), and the Civilian Authorized Salaries and Other Operational Requirements programs.

The Military HIV Program supports the research and development to develop candidate HIV vaccines, to assess safety and effectiveness in human subjects and to protect military personnel from risks associated with HIV infection.

The WRAIR Vaccine Production Facility research Project supports the development and licensure of vaccines and relevant biologics critical to the global health of our Warfighters serving domestically or abroad in compliance with Food and Drug Administration (FDA) regulations.

The UBB Testing medical research Project provides funds to establish a scientific and statistical basis for evaluating skeletal injuries to vehicle occupants during ground vehicle UBB events. Areas of interest to the Secretary of Defense are medical research that provides an understanding of the human response and tolerance limits and injury mechanisms needed to accurately predict skeletal injuries to ground combat vehicle occupants caused by UBB events. This enhanced understanding will support the establishment of an improved capability to conduct Title 10 Live Fire Test and Evaluation and to make acquisition decisions.

The Deployed Warfighter Protection program Armed Forces Pest Management Board provides for the development of new or improved protection of military personnel from insects and tick vectors of disease pathogens.

The MODS, PPVDAS, and MHCE identify, explore and demonstrate key technologies to overcome medical and military unique technology barriers.

The Civilian Authorized Salaries and other operational requirements provide funding for authorized civilian workforce performing medical research, development, acquisition management and oversight that support the medical research, development, test, and evaluation (RDTE) programs at the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, Maryland.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	26.711	26.521	0.000	-	0.000
Current President's Budget	26.711	26.508	0.000	-	0.000
Total Adjustments	0.000	-0.013	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Transfer	-	-0.013	-	-	-

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>				Project (Number/Name) EB3 / <i>HIV Medical Development</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
EB3: <i>HIV Medical Development</i>	-	26.711	26.508	-	-	-	-	-	-	-	0.000	53.219
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Military Human Immunodeficiency Virus (HIV) Research Program develops vaccine candidates, to assess their safety and effectiveness in human subjects, and to protect military personnel from risks associated with HIV infection. All HIV technology development is conducted in compliance with United States Food and Drug Administration (FDA) regulations. This program is jointly managed through an Interagency Agreement between the United States Army Medical Research and Development Command (USAMRDC) and the National Institute of Allergy and Infectious Diseases. The cited work is also consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology focus areas.

The Walter Reed Army Institute of Research (WRAIR) Vaccine Pilot Bioproduction Facility (PBF) is the Department of Defense (DOD) only facility capable of producing good manufacturing practices (GMP) quality biologic products for use in early phase clinical trials. The mission of the WRAIR PBF is to support the development and licensure of vaccines and relevant biologics critical to the global health of our Warfighters serving domestically or abroad in compliance with United States FDA regulations. This project supports vaccine development efforts of strategic importance to the DoD, including Service medical research and development programs, those of other DoD organization such as the Defense Threat Reduction Agency and the Defense Advanced Research Projects Agency, and pandemic bio preparedness for emerging infectious disease threats in the Global Health Security Agenda.

The Underbody Blast (UBB) Testing medical research project will provide new data on the biomechanics of human skeletal response that occurs in an attack on a ground combat vehicle, it will provide better protection to mounted warriors from the effects of underbody blast caused by landmines or improvised explosive devices (IEDs). The data will provide a biomedical basis for the development of a Warrior-representative blast test manikin (the Warrior Injury Assessment Manikin or WIAMan project) and the required biomedically-valid injury criteria that can be used in Title 10 Live Fire Test and Evaluation (LFT&E) to characterize dynamic events, the risk of injury to mounted warriors, and to support acquisition decisions. The data produced by this project will be used to satisfy a critical need for a scientifically valid capability for analyzing the risk of injury caused by UBB.

The Deployed Warfighter Protection project, the Armed Forces Pest Management Board (AFPMB), plans to develop new or improved protection for ground forces from disease-carrying insects. The focus of this program is to develop new or improved systems for controlling insects that transmit malaria, dengue, chikungunya and other emerging infectious diseases under austere, remote, and combat conditions; understand the physiology of insecticidal activity to develop new compounds with greater specific activity and/or higher user acceptability; examine existing area repellents for efficacy and develop new spatially effective repellent systems useful in military situations; develop new methods or formulations for treating cloth to prevent vector biting; and expand the number of active ingredients and formulations of public health pest pesticides, products and application technologies available for safe, and effective applications. The AFPMB partners with the President's Malaria Initiative and the World Health Organization Global Malaria Program to lead development of new tools for insect-borne disease prevention.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>	Project (Number/Name) EB3 / <i>HIV Medical Development</i>
--	--	--

The Medical Operational Data System (MODS) deploys modernized data visualization capabilities to enhance Army Unit and Individual Medical Readiness Reporting. MODS provides Army leadership with a responsive and reliable human resource and readiness information management data system for all categories of military and civilian medical and support personnel. MODS provide Tri-Service support through applications such as Electronic Profile, Behavioral Health, and Medical Education.

The Pharmacovigilance Defense Application System (PVDAS) provides military providers Defense Patient Safety reports from the FDA after a drug's release to market. The program identifies, explores, and demonstrates key information technologies to overcome medical and military unique technology barriers.

The Mobile HealthCare Environment (MHCE) is the capability of secure, bidirectional messaging and data exchange between patients, providers and clinics using any electronic device. The program identifies, explores, and demonstrates key information technologies to overcome medical and military unique technology barriers.

The Civilian Authorized Salaries and Other Operational requirements provide funding for authorized civilian workforce performing medical research, development, acquisition management and oversight that support the medical research, development, test, and evaluation (RDTE) programs at the United States Army Medical Research and Development Command (USAMRDC), Fort Detrick, Maryland.

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

	FY 2021	FY 2022	FY 2023
<p>Title: HIV Medical Development</p> <p>Description: The Military HIV Research Program aims to mature candidate HIV vaccines, to validate their safety and effectiveness in human subjects, and to protect the military personnel from risks associated with HIV infection. These activities also include development of monoclonal antibody candidates to address HIV risk to the blood supply in large scale combat operations This project determines one or more prevention countermeasure candidates that are optimized through pre-clinical down-selection studies in large animal models and conducts human clinical trials in Africa, Asia and the United States to test for safety and immunogenicity (ability to invoke an immune response), and contributes to early proof of concept efficacy testing.</p> <p>FY 2022 Plans: Military Health Research Program will complete a human trial evaluating multi-dose vaccine regimens with the optimized dose of the Army?s lead adjuvant, determining a lead protein boost vaccine candidate for further development; determine whether rapid administration of vaccines can elicit stronger antibody responses; determine which formulations of the leading Army adjuvant are the best for safety, immune responses and manufacturing; demonstrate Good Manufacturing Practice manufacture of next generation subtype B mosaic vaccine candidates, informed by results from trials in large animal models.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>	7.909	7.833	-
<p>Title: WRAIR Vaccine Production Facility Research</p>	8.189	8.107	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>	Project (Number/Name) EB3 / <i>HIV Medical Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: The WRAIR Vaccine Pilot Bioproduction Facility (PBF) will focus on advanced technology development and transition through production of early phase (1/2a) clinical materials from varied platforms, such as live virus, conjugates, recombinant proteins, monoclonal antibodies, Ribonucleic Acid (RNA) and deoxyribonucleic acid (DNA) approaches that: (a) expand collaborative partnerships for product development that meet DoD requirements; (b) open active intramural-based discovery efforts of new products for development; and (c) initiate and extend strategic partnerships with external collaborators (Government and industry) to develop/co-develop potential new biologic approaches to pandemic disease preparedness.</p> <p>FY 2022 Plans: The WRAIR Pilot Bioproduction Facility is a support function for novel S&T programs from across MRDC and the DoD to advance the development of vaccine products into early phase (1/2a) clinical trials. Following full operational capability establishment in FY21 the PBF will focus on fostering partnerships with both internal and external stakeholders to continue vaccine and biologic production efforts to support transfer of 6.1-6.3 budget activities for DoD and external stakeholders. These efforts will align to the technology maturation and risk reduction of medical countermeasures for through early phase (1/2a) clinical trials to assess safety and effectiveness of candidate vaccines to support the warfighter.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>			
<p>Title: Underbody Blast Testing</p> <p>Description: The UBB Testing will provide an understanding of the biomechanics of skeletal injuries that occur in a combat vehicle UBB event involving a landmine or improvised explosive device (IED), and the biomedical basis for the development of a Warrior-representative blast test manikin and associated biomedically-validated injury criteria that can be used to characterize dynamic events and injury risks for Live Fire Test and Evaluation (LFT&E) crew survivability assessments and vehicle development efforts to better protect Warriors from UBB threats.</p>	1.274	-	-
<p>Title: Deployed Warfighter Protection</p> <p>Description: The Deployed Warfighter Protection program will mature new or improved tools to protect deployed forces from disease-carrying insects and ticks.</p> <p>FY 2022 Plans: The Deployed Warfighter Protection program continues early translational research for the development of novel tools that protect deployed forces from biting ticks, mosquitoes and other insects which transmit lethal and force degrading diseases. The Armed Forces Pest Management Board (AFPMB) continues to inform the development of performance requirements and necessary test</p>	6.347	6.303	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>	Project (Number/Name) EB3 / <i>HIV Medical Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>and evaluation plans to determine a candidate product's capabilities and limitations. Novel vector control capabilities (including RNAi insecticides targeting specific vector species) and personal bite protection tools (including new uniform fabric technologies and area repellents) will be developed for further testing in operationally relevant environments.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>				
<p>Title: Medical Operational Data System</p> <p>Description: The Medical Operational Data System is the Army's authoritative data source for Individual Medical Readiness (IMR) reporting, and supports Army Global Medical Force Readiness (GMFR) to include the Army Surgeon General Title X responsibilities to recruit, retain, pay and train the Army Medical Force.</p> <p>FY 2022 Plans: MODS will complete the Engineering Process needed for required modifications to the MODS Medical Assembly Mobilization Planning Data Platform to support the Army's evolving business/operational requirements in support of Medical Readiness of the Force.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>		1.868	1.909	-
<p>Title: Pharmacovigilance Defense Application System</p> <p>Description: The PVDAS provides military providers Defense Patient Safety reports from the FDA after a drug's release to market.</p> <p>FY 2022 Plans: Pharmacovigilance Defense Application System will demonstrate modifications to directly access to military healthcare databases, thus eliminating the need for its own data warehouse, to give the application access to the most up-to-date information while also increasing capability and capacity to conduct drug studies and analyses. The results will optimize drug-use safety and improve prescribing practices in the Military Healthcare System (MHS) at reduced total cost of ownership (TCO).</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>		0.224	0.304	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>	Project (Number/Name) EB3 / <i>HIV Medical Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.				
<p>Title: Mobile Health Care Environment</p> <p>Description: The Mobile HealthCare Environment matures and demonstrates technologies to support the capability of secure, bidirectional messaging and data exchange between patients, providers and clinics using any electronic device.</p> <p>FY 2022 Plans: Will continue device and data integration with backend records databases. Demand in these areas requires extensive requirements analysis, programming, and validation of secure chat, video and file sharing capabilities within the platform expansion completed for data integration.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0603115DHA, Project Code 373H.</p>		0.238	0.331	-
<p>Title: Civilian Authorized Salaries and Other Operational Requirements</p> <p>Description: Funding is provided to the USAMRDC for Medical Research Development Acquisition (RDA) Management and Oversight to include the payroll of civilians as well as nominal operating expense</p> <p>FY 2022 Plans: Will fund civilian salaries and associated expenses (supplies, equipment, travel, etc.) at USAMRDC. Funding also provided regulatory, clinical monitoring and data support for the Special Immunization Program as necessary. This program will provide non-licensed vaccines under FDA oversight to personnel at risk of exposure to selected infectious diseases.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding and mission realigned as part of US Army Medical Research and Development Command transfer to the Defense Health Agency in order to meet Congressional intent as outlined in NDAA 2019 (Section 711) and NDAA 2020 (Section 737). Funding transferred to Program Element 0606105DHA, Project Code 376B.</p>		0.662	0.753	-
<p>Title: SBIR/STTR Tax</p> <p>FY 2022 Plans: SBIR/STTR tax.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>		-	0.968	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603115A / <i>Medical Development</i>	Project (Number/Name) EB3 / <i>HIV Medical Development</i>
--	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638.			
Accomplishments/Planned Programs Subtotals	26.711	26.508	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	8.066	9.796	-	9.796	14.361	15.493	12.415	10.382	0.000	70.513
<i>CG2: Lethality Enabling University Adv Development</i>	-	-	6.981	7.653	-	7.653	8.556	8.080	8.517	8.515	0.000	48.302
<i>CH5: Terminal Effects Against Critical Targets Adv Tech</i>	-	-	1.085	2.143	-	2.143	4.002	5.139	1.026	1.867	0.000	15.262
<i>DB2: Future Armaments Scalable Technologies*</i>	-	-	-	-	-	-	1.803	2.274	2.872	-	0.000	6.949

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

Work done in this Program Element (PE) matures technologies, methodologies, and models required to enable next generation lethality. The PE focuses on: lethal mechanism technologies for projectiles and warheads that provide revolutionary capability to defeat Tier 1 adversary vehicle and body armors; selection of propulsion and energetic materials and technology to validate novel energetic materials concepts to exploit controllable energy release for future gun/missile systems; scalable effects for mixed target defeat while simultaneously decreasing warhead mass; experimentation of materials solutions for improvement of weight and volume efficiency, lethal effects and sustainability for the warfighter in the Army of today and beyond; and multiple pathways to enhance lethal effects by investigating synergistic effects of novel micro warheads using advanced materials.

This PE continues to mature and demonstrate technology developed under PE 0602141A (Lethality Technology).

Work in this PE complements PE 0603118A (Soldier Lethality Advanced Technology), PE 0603462A (Next Generation Combat Vehicle Advanced Technology), PE 0603464A (Long Range Precision Fires Advanced Technology), 0603465A (Future Vertical Lift Advanced Technology), and 0603466A (Air and Missile Defense Advanced Technology).

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

Research in this PE is performed by the United States (US) Army Futures Command (AFC).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	8.066	0.000	-	0.000
Current President's Budget	0.000	8.066	9.796	-	9.796
Total Adjustments	0.000	0.000	9.796	-	9.796
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	9.796	-	9.796

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>				Project (Number/Name) CG2 / <i>Lethality Enabling University Adv Development</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CG2: <i>Lethality Enabling University Adv Development</i>	-	-	6.981	7.653	-	7.653	8.556	8.080	8.517	8.515	0.000	48.302
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Project leverages advanced developments and technological innovations from academia, of lethal directed energy, laser diagnostics and accelerated design of future hypersonics and their scramjet engine combustion, deep learning and novel materials of importance to the Army, by maturing developments and performs demonstrations focused on getting technology to the warfighter more quickly. This Project exploits advanced research and development efforts to focus more on mid to far-term Army modernization priorities while also maintaining delivery of near-term technologies critical to the Long Range Precision Fires and Air and Missile Defense. This Project focuses on maturation and demonstration of various advanced technologies originating from extramural applied research in academia pertaining to lethal directed energy, laser diagnostics, future hypersonic glide body and scramjet propulsor design, deep learning, novel materials, and expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range applied to lethality. This effort validates advanced research and performs demonstrations leading to potential emerging technologies in areas of strategic importance to the Army in directed energy, future hypersonic glide body design, deep learning and novel materials, etc., by bringing competitively selected Universities with research and development teams into Technical Alliances.

Work in this Project supports the Army Modernization Priority Long Range Precision Fires and Air and Missile Defense.

The cited work is consistent with 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 (US) Army Futures Command.

This work is done in coordination with PE 0620141A (Lethality Technology), PE 0602147A (Long Range Precision Fires), PE 0603464A (Long Range Precision Fires Advanced Technology), and PE 0603466A (Air and Missile Defense Advanced Technology)

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

	FY 2021	FY 2022	FY 2023
Title: Laser Diagnostics for Hypersonics and Directed Energy	-	2.144	2.208
Description: This effort matures laser diagnostics to assess turbulence and boundary layer transition, leading to validation of hypersonic flight models and enhanced directed energy system effectiveness and range through improved targeting, prediction and beam control.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technol ogy</i>	Project (Number/Name) CG2 / <i>Lethality Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature a suite of laser diagnostics for hypersonic ground testing and models to predict effects of atmospheric turbulence on laser propagation. Advanced development to inform the expansion of the Ballistic, Aero-Optics and Materials (BAM)) range for testing and evaluation of hypersonic and directed energy systems.</p> <p>FY 2023 Plans: Will continue to mature a suite of laser diagnostics for hypersonic ground testing and models to predict effects of atmospheric turbulence on laser propagation. Develop capabilities to capture time volumetric gas density hypersonic flow imagery. Advanced development to inform the expansion of the BAM range for testing and evaluation of hypersonic and directed energy systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Turbulence and Transition Modeling and Validation for Hypersonic Vehicles</p> <p>Description: This effort matures modeling turbulence and transition for hypersonic vehicles to accelerate design of future hypersonic glide bodies and systems through modeling and sub scale testing.</p> <p>FY 2022 Plans: Will accelerate and mature the design and advancement of hypersonic glide bodies and systems through turbulence and transition modeling. Reduce flight test risk through modeling and sub scale wind tunnel testing of effects of new design features. Advanced development to inform the expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range for testing and evaluation of aerothermodynamic performance at hypersonic speeds.</p> <p>FY 2023 Plans: Will continue to accelerate and mature the design and advancement of hypersonic glide bodies and systems through turbulence and transition modeling. Will mature boundary layer transition code development. Reduce flight test risk through modeling and sub scale wind tunnel testing of effects of new design features. Advanced development to inform the expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range for testing and evaluation of aerothermodynamic performance at hypersonic speeds.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>		-	2.789	2.718
<p>Title: Novel Materials for Extreme Environments</p> <p>Description: This effort matures and validates computational and multiscale models of high strain rate materials to mitigate the effects of hypervelocity impacts (HVIs) and offer thermal protection.</p> <p>FY 2022 Plans:</p>		-	0.737	0.800

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>	Project (Number/Name) CG2 / <i>Lethality Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature and validate critical high temperature materials and characterization testing and analysis capability for the design of thermal protection systems to defeat emerging threats from hypersonic weapons. Provide protection overmatch from high kinetic energy impacts through material layering and unique structures.</p> <p>FY 2023 Plans: Will continue to mature and validate critical high temperature materials and characterization testing and analysis capability for the design of thermal protection systems to defeat emerging threats from hypersonic weapons. Mature numerical algorithms of select materials. Provide protection overmatch from high kinetic energy impacts through material layering and unique structures.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Intelligent Hypersonics and Other Missile Defense Systems</p> <p>Description: This effort matures and validates hypersonic vehicle flight systems with deep learning neural networks that can adapt to changing conditions and become more lethal. Integration of air and missile defense (AMD) command and control (C2) systems and their instrumentation, simulation, and stimulation.</p> <p>FY 2022 Plans: Will validate ablation characteristics and the semi-autonomous synthetic flight control systems performance utilizing machine learning and deep neural network tools for hypersonic vehicle geometries. Will integrate robust and extensible instrumentation, simulation, and stimulation prototype capability for prototype development, and operational testing of air and missile defense (AMD) C2 systems.</p> <p>FY 2023 Plans: Will validate ablation characteristics and the semi-autonomous synthetic flight control systems performance utilizing machine learning and deep neural network tools for hypersonic vehicle geometries. Will fabricate and mature axisymmetric prototype scramjet propulsor with transpiration fuel delivery system for high-speed projectiles. Will integrate robust and extensible instrumentation, simulation, and stimulation prototype capability for prototype development, and operational testing of AMD C2 systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The increased funding provides to develop an optimally designed scramjet propulsor that leverages transpiration fuel supply and boundary layer mixing enhancement to reduce aerodynamic drag, increase impact velocity and extend range of precision strike munitions.</p>		-	1.057	1.927
<p>Title: SBIR/STTR Transfer</p> <p>FY 2022 Plans:</p>		-	0.254	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>	Project (Number/Name) CG2 / <i>Lethality Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement:				
Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		-	6.981	7.653
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>				Project (Number/Name) CH5 / <i>Terminal Effects Against Critical Targets Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH5: <i>Terminal Effects Against Critical Targets Adv Tech</i>	-	-	1.085	2.143	-	2.143	4.002	5.139	1.026	1.867	0.000	15.262
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates engineering tools and high-fidelity modeling and simulation capabilities to predict and optimize weapon performance to ensure lethality against structures and critical assets. This project provides validated engineering tools and technologies to rapidly evaluate and predict weapon performance.

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

Research in this Project is performed by the United States (U.S.) Engineer Research and Development Center (ERDC) in coordination with U.S. Army Futures Command (AFC).

Research in this Project complements PE 0602141A (Lethality Technology) / Project CF8 (Terminal Effects Against Critical Targets Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Terminal Effects Demonstration	-	1.045	2.143
Description: Demonstrates and provides a predictive capability for terminal effects and lethality and a fast running engineering tool to support Long Range Precision Fires (LRPF) weaponeering on critical structural and geological targets of interest.			
FY 2022 Plans: Provide engineering codes for blast effects against structures and critical targets and will demonstrate damage detection algorithms for Battle Damage Assessment (BDA) tools.			
FY 2023 Plans: Will demonstrate and provide high fidelity and fast-running runway cratering tools for damage prediction of Army Fires munitions; and provide and integrate steel penetration algorithms for army munitions on critical target sets into weapon effects code.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects the planned lifecycle of this effort to demonstrate and provide technologies completed in PE 0602141A (Lethality Technology) / Project CF8 (Terminal Effects Against Critical Targets Tech).			
Title: FY 2022 SBIR/STTR Transfer	-	0.040	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / <i>Lethality Advanced Technology</i>	Project (Number/Name) CH5 / <i>Terminal Effects Against Critical Targets Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		-	1.085	2.143
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603117A / <i>Army Advanced Technology Development</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	64.163	76.815	134.874	-	134.874	141.342	152.643	100.027	74.852	0.000	744.716
BS2: <i>Army Advanced Technology Development</i>	-	64.163	76.815	134.874	-	134.874	141.342	152.643	100.027	74.852	0.000	744.716

A. Mission Description and Budget Item Justification

The Army Advanced Technology Development budget line includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

Efforts develop proof of technological feasibility and assessment of subsystem and component operability that may lead to full system development and prototyping.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	62.663	76.815	0.000	-	0.000
Current President's Budget	64.163	76.815	134.874	-	134.874
Total Adjustments	1.500	0.000	134.874	-	134.874
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.500	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	134.874	-	134.874

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					R-1 Program Element (Number/Name) PE 0603118A / Soldier Lethality Advanced Technology							
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	154.161	152.369	100.935	-	100.935	92.336	93.015	107.234	115.561	0.000	815.611
AY5: Soldier Squad Small Arms Armaments Advanced Tech	-	9.797	11.447	6.516	-	6.516	6.622	6.615	6.616	6.615	0.000	54.228
AY7: Small Arms Fire Control Advanced Technology	-	13.315	13.094	3.066	-	3.066	2.564	-	-	-	0.000	32.039
AY9: Body Armor & Integrated Headborne Advanced Tech	-	9.520	7.704	8.112	-	8.112	8.211	10.666	10.589	10.563	0.000	65.365
AZ6: Soldier Signature Management Advanced Technology	-	1.605	2.969	3.084	-	3.084	3.116	3.131	3.132	3.132	0.000	20.169
BB3: Dismounted Soldier Survivability Equip/Tech Integ	-	1.238	3.026	3.458	-	3.458	3.522	3.518	3.519	3.518	0.000	21.799
BB6: Physical Augmentation: Adv Tech for Field Demo	-	2.865	-	-	-	-	-	-	-	-	0.000	2.865
BB8: Soldier Centric Advanced Technology	-	5.622	5.292	2.391	-	2.391	1.880	-	-	-	0.000	15.185
BC1: Human Performance AdvTech for Mobility & Lethality	-	12.207	13.944	9.415	-	9.415	6.986	7.374	7.325	7.321	0.000	64.572
BC4: Soldier Decision Making&Comms Performance AdvTech	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
BC8: Training Advanced Technology (Other than STE)	-	4.140	2.993	7.078	-	7.078	7.650	10.289	23.443	31.277	0.000	86.870
BC9: Adv Soldier Sensors/ Displays AdvTech for Dismounts	-	8.738	13.151	25.963	-	25.963	27.040	26.606	28.425	28.937	0.000	158.860
BD7: Soldier Sys Interfaces/ Integration-Sensor AdvTech	-	9.110	8.374	8.535	-	8.535	8.196	8.590	9.311	9.309	0.000	61.425
BD9: Soldier & Sm Unit Tactical Energy AdvTech	-	6.041	3.171	4.189	-	4.189	4.269	4.520	4.518	4.517	0.000	31.225

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army										Date: April 2022			
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>								
<i>BE2: Joint Service Combat Feeding Advanced Technology</i>	-	2.367	2.424	1.988	-	1.988	2.019	2.016	2.121	2.120	0.000	15.055	
<i>BE5: Personnel & Airdrop Safety Advanced Technology</i>	-	5.707	6.879	6.484	-	6.484	6.603	6.668	7.306	7.304	0.000	46.951	
<i>BE9: STE Advanced Technology</i>	-	14.764	13.401	10.656	-	10.656	3.658	3.022	0.929	0.948	0.000	47.378	
<i>BS8: Soldier Lethality Advanced Technology</i>	-	45.200	44.500	-	-	-	-	-	-	-	0.000	89.700	

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates Soldier Lethality technologies that improve Soldier operational performance by increasing lethality, mobility, protection, and optimizing situational awareness across the spectrum of operating environments and missions. This PE matures Soldier weapons and enabling components / subsystems, demonstrates lethal weapons systems with potential to provide greater lethality, target acquisition, fire control, and range at a significantly reduced weight for optimized Soldier and Small Unit system performance. The major focus areas for Soldier Lethality Science and Technology are Soldier weapons and ammunition technologies, protection technologies, cognitive and physical performance measures, training in synthetic training environments, and mission support capabilities such as situational awareness sensors and displays, dismounted power and energy technologies, and Soldier and Small Unit sustainment capabilities. This technology diverse PE also matures and demonstrates sensor technologies that increase Warfighter situational understanding, survivability, and lethality by providing sensor capabilities to acquire and engage all targets and threats at longer ranges in complex environments and operational conditions (e.g. day/night, obscured, smoke, adverse weather, and other degraded visual environments), and for advancing live training technologies that accurately replicate and realistically represent the effects of current and future weapons systems during force-on-force and force-on-target training. This PE matures and demonstrates effective technology in personal combat clothing, protective equipment such as personal armor, helmets, and eyewear, combat rations, shelters, logistical support items for aerial delivery of personnel and cargo, and energy systems to power current and emerging Soldier-born Intelligence, Surveillance, and Reconnaissance (ISR), sensor, optical, and communication systems with the least weight and sustainment burden on the Soldiers and Small Combat Units. This PE also matures and demonstrates technologies supporting the Army's Synthetic Training Environment (STE), a single, interconnected synthetic training system that will enable Army units and leaders to conduct realistic multi-echelon / multi-domain combined arms maneuver and mission command training, increasing proficiency through repetition. A specific research thrust area is applying systems-based practices to mature and demonstrate scientific and tailored knowledge of Soldiers' physical and cognitive architecture to facilitate rapid and efficient designs, assessments and trade-off analyses of technology insertions on the Soldier. Significant science and technology (S&T) investments are directed to improve the effectiveness of the technologies a Soldier utilizes while reducing the size and weight of the form factor of the equipment.

Research in this PE complements PE 0602143A (Soldier Lethality Technology).

This PE is directly aligned to the Soldier Lethality and STE Modernization Priorities.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603118A / Soldier Lethality Advanced Technology
--	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	151.370	107.966	0.000	-	0.000
Current President's Budget	154.161	152.369	100.935	-	100.935
Total Adjustments	2.791	44.403	100.935	-	100.935
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	44.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.791	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	100.935	-	100.935
• FFRDC Transfer	-	-0.097	-	-	-

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

Project: BS8: *Soldier Lethality Advanced Technology*

- Congressional Add: *Program Increase - Advanced AI/AA Analytics for Modernization and Readiness*
- Congressional Add: *Program Increase - Small Arms Fire Control Advanced Technology*
- Congressional Add: *Program Increase: Advanced Technology for Maneuver Support and Protection*
- Congressional Add: *Program Increase - Military Engineering Technology for Infield Waste*
- Congressional Add: *Program Increase - Flexible LED Lighting for Tents and Shelters*
- Congressional Add: *Program Increase*
- Congressional Add: *Ferrium Steel for Improved Personal Protective Equipment*
- Congressional Add: *Human Machine Teaming*
- Congressional Add: *Impact Attenuation Materials for Limb Protection*
- Congressional Add: *Soldier Situational Awareness*
- Congressional Add: *Squad Operations Advanced Resupply*

Congressional Add Subtotals for Project: BS8

Congressional Add Totals for all Projects

	FY 2021	FY 2022
	10.000	10.000
	8.000	8.000
	10.000	-
	2.000	-
	5.200	-
	10.000	-
	-	5.000
	-	4.000
	-	1.500
	-	8.000
	-	8.000
Congressional Add Subtotals for Project: BS8	45.200	44.500
Congressional Add Totals for all Projects	45.200	44.500

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity
2040: *Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)*

R-1 Program Element (Number/Name)
PE 0603118A / *Soldier Lethality Advanced Technology*

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) AY5 / <i>Soldier Squad Small Arms Armaments Advanced Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AY5: <i>Soldier Squad Small Arms Armaments Advanced Tech</i>	-	9.797	11.447	6.516	-	6.516	6.622	6.615	6.616	6.615	0.000	54.228
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates individual and crew-served weapon designs and technologies that enhance the fighting capabilities and survivability of the dismounted Warfighter in support of the Army's Soldier Lethality Modernization priority and all of the Services. All work is led by the Joint Service Small Arms Program (JSSAP) and is based upon the Joint Service Small Arms Master Plan (JSSAMP) and the Joint Capabilities Integration Development System's Small Arms Analyses.

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

This Project complements work done in Program Element (PE) 0602143A (Soldier Lethality Technology) / AY6 (Soldier Squad Small Arms Armaments Technology).

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Small Arms Technology Demonstration	2.900	4.720	6.516
Description: This effort matures and demonstrates the Next Generation Family of Ammunition by optimizing small arms ammunition and weapon system technologies for integration into live fire demonstrations. It refines weapon system integration and supports the Joint Warfighter's small arms capability needs as well as validates small arms weapon system technology readiness levels and confidence of design functionality in advanced operating scenarios.			
FY 2022 Plans: Will mature and demonstrate technological advancements of small arms systems in relevant environments; mature and demonstrate automated target recognition and engagement technologies, signature reduction devices, technologies and evaluations for legacy and Next Gen weapons, ammunition design optimizations for novel targets, augmented weapon system controllability, and advanced optical systems with machine learning algorithms for technology insertions into emerging systems identified by the Joint Warfighters.			
FY 2023 Plans: Will validate small arms system/subsystem models in relevant environments to ensure optimal performance against relevant targets; optimize automated target recognition and engagement technologies, signature reduction devices, and technologies and evaluations for legacy and next generation weapons; improve performance of: ammunition for novel targets; augmented weapon			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) AY5 / <i>Soldier Squad Small Arms Armaments Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
system controllability and maintainability, and advanced optical systems with machine learning algorithms; demonstrate potential technology insertions into current and emerging systems identified by the Joint Warfighter. FY 2022 to FY 2023 Increase/Decrease Statement: Increase provides for further maturation of prior Applied Research investments into Technical Readiness Level (TRL) 6 technology demonstrations and transitions to the Program Managers focused on dismounted Soldier improvements in denied and austere environments in the areas of remote powered armament systems, increased probability of hit, Next Generation Soldier Weapon supporting technologies, signature reduction technologies, and small arms lethality increases.				
Title: Next Generation Family of Ammo Description: This effort matures and demonstrates the next generation of small arms live training ammunition by optimizing it through integration into new weapon systems that will provide an increased level of lethality. FY 2022 Plans: Will improve performance of initial base technologies of the combat tracer and reduced range tracer concepts to validate and demonstrate capability as fully functional projectiles. Ammunition effort aligned with the Next Generation Squad Weapon (NGSW). FY 2022 to FY 2023 Increase/Decrease Statement: Fiscal Year 2022 (FY22) is the final year of execution for this task.		6.897	6.309	-
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.418	-
Accomplishments/Planned Programs Subtotals		9.797	11.447	6.516
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) AY7 / <i>Small Arms Fire Control Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AY7: Small Arms Fire Control Advanced Technology</i>	-	13.315	13.094	3.066	-	3.066	2.564	-	-	-	0.000	32.039
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates fire control and targeting sensor technologies and techniques to improve targeting and lethality in order to maintain overmatch at longer ranges in all operational environments and to meet the capability needs of Army Science and Technology Soldier Lethality, Next Generation Combat Vehicle, and Long Range Precision Fires modernization priorities.

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

This Project complements work done in Program Element (PE) 0602143A (Soldier Lethality Technology) / AY8 (Small Arms Fire Control Technology).

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Small Arms Fire Control Advanced Technology	13.315	11.310	-
Description: This effort will mature and demonstrate fire control and targeting sensor technologies and techniques to improve targeting and lethality, and maintain overmatch at longer ranges in all environments.			
FY 2022 Plans: Will complete maturation of digital weapon sight fire control system prototypes; demonstrate final digital weapon sight configuration; execute technology demonstrations in relevant environments to support system optimization of target handoff and target cueing capabilities; optimize capability to enable seamless integration with Enhanced Night Vision Goggle-Binocular (ENVG-B), Integrated Visual Augmentation System (IVAS), and Next Generation Squad Weapon (NGSW); complete prototype integration for fire support and dismounted scout operations; demonstrate multifunction precision targeting capabilities in military relevant environments.			
FY 2022 to FY 2023 Increase/Decrease Statement: Task ends in Fiscal Year 2022 (FY22)			
Title: Advanced Fire Control Tech	-	1.306	3.066

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) AY7 / <i>Small Arms Fire Control Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: This effort will mature and demonstrate fire control and targeting sensor technologies and techniques to improve targeting and lethality, and maintain overmatch at longer ranges in all environments.</p> <p>FY 2022 Plans: Will mature and demonstrate technologies of integrated circuit boards to improve performance and reliability under pyro-shock and reduced power consumption</p> <p>FY 2023 Plans: Will mature machine vision databases for target recognition, to include optimization for dismounted weapon identification; validate approach for demonstration of platform architecture; improve internal communication to include the use of open source standards; demonstrate integration of augmented reality and polymer optic components for future live fire capability demonstration.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase in FY 2023 is due to natural task execution ramp up from requirements generation to tech maturation and demonstrations.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.478	-
Accomplishments/Planned Programs Subtotals	13.315	13.094	3.066

<p>C. Other Program Funding Summary (\$ in Millions) N/A</p> <p>Remarks</p> <p>D. Acquisition Strategy N/A</p>

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) AY9 / <i>Body Armor & Integrated Headborne Advanced Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AY9: <i>Body Armor & Integrated Headborne Advanced Tech</i>	-	9.520	7.704	8.112	-	8.112	8.211	10.666	10.589	10.563	0.000	65.365
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates body armor weight reductions and improves the performance of personal protection and survivability equipment. It also demonstrates combat helmet ballistic, blast, and small arms protection performance enhancements and the integration and optimization of power, energy, and digital sensor and display headborne technologies.

This Project supports Force Protection capability demonstrations for Soldiers and Small Units and demonstrated technologies from this effort transition to various Program Executive Office (PEO) Soldier programs.

This Project complements work done in Program Element (PE) 0602143A (Soldier Lethality Technology) / AZ2 (Body Armor & Integrated Headborne Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Body Armor and Integrated Headborne Advanced Technology	9.520	7.422	8.112
Description: This effort focuses on maturing, integrating and demonstrating personal protective capabilities against ballistic, blast, and directed energy threats as well as the development and demonstration of Soldier worn platform architectures to optimize the integration of personal protective equipment and Soldier lethality enabling technologies. Demonstrates advanced test methods to validate personal protective equipment performance enhancements against current and emerging small arms, fragmentation, and blast threats from anti-personnel munitions. The objective of these technology development efforts is to significantly increase Soldier lethality by enhancing the protective capabilities and reducing sub-system and system-level weight of individual protective equipment to reduce the Soldier burden and increase survivability.			
FY 2022 Plans: Will exploit state of the art high performance ballistic materials for body armor against small arms threats to provide trade space analysis regarding art of the possible to Army stakeholders and inform future requirements for torso protection against small arms threats; Exploit novel and emerging processing techniques and latest developmental materials for combat helmets to assess state			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) AY9 / <i>Body Armor & Integrated Headborne Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>of the art helmet performance against small arms threats and inform future protection requirements for Army combat helmets; Design power and data interface architectures for combat helmets to develop common interface design standards for Soldier headborne technology; Develop communication headset subsystems with new wireless down links to the individual radio and integrate preliminary enhanced audio capabilities to provide hearing protection and situational awareness cues.</p> <p>FY 2023 Plans: Will mature designs for personnel body armor against classified small arms threat that increase body armor protection capabilities without increasing the weight of armor material required; exploit anti-personnel munitions to characterize Soldier survivability against near-peer munition capabilities to further the optimization of personal body armor against high energy fragmenting munitions; mature novel fabric constructions integrated in the Soldier combat protective ensemble for ballistic protection; mature power and data interface architectures for combat helmets to develop common interface design standards for Soldier headborne technology; optimize the integration of communication headset subsystems with wireless down links to the individual radio and demonstrate enhanced audio capabilities to provide hearing protection and situational awareness cues; demonstrate integrated eye protection capability with enhanced fragmentation performance and situational awareness.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.282	-
Accomplishments/Planned Programs Subtotals		9.520	7.704	8.112
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) AZ6 / <i>Soldier Signature Management Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AZ6: Soldier Signature Management Advanced Technology</i>	-	1.605	2.969	3.084	-	3.084	3.116	3.131	3.132	3.132	0.000	20.169
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project optimizes, matures and demonstrates advances in novel materials, technologies, techniques, and applications increasing the capabilities of camouflage, concealment, and deception against known and emerging sensor threats. These technologies will produce proof of concept systems that decrease the probability of detection and targeting by peer and near-peer adversaries, enabling freedom of movement of semi-independent and dispersed formations, and increase protection of high-valued assets. This Project will demonstrate disruptive Camouflage, Concealment and Deception technologies, supporting expeditionary maneuver in the Multi-Domain Battle Environment to open and retain windows of advantage.

Research in this Project supports key Army needs and leverages/complements the technical research of several Program Elements (PEs) and Projects to include PE 0602143A (Soldier Lethality Technology) / BB4 (Dismounted Soldier Survivability Materials), Project AZ5 (Soldier Protection Technology - Vulnerability), Project AZ9 (Soldier Protection Advanced Tech - Detectability); PE 0601102A (Defense Research Sciences; and PE 0602145A (Next Generation Combat Vehicle Technology) / Project BI2 (Sensor Protection Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Soldier Camouflage, Concealment and Decoys Demonstration	1.605	2.861	3.084
Description: This effort demonstrates innovative camouflage, concealment, and deception technologies for the dismounted Soldier to defeat advanced current and emerging adversary Intelligence, Surveillance and Reconnaissance (ISR) threats and to reduce the probability of detection and identification across the electromagnetic spectrum. Matures physics-based models for material and system performance that support probability of detection metrics in the multi-domain operational environment, assisting to close the capability gap between current camouflage, concealment, and deception technologies and defeating enemy sensorial capabilities in future operating environments.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) AZ6 / <i>Soldier Signature Management Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will optimize down- selected textile coatings and functional garment designs for Soldier clothing and individual equipment to inconspicuously transfer Soldier thermal emissions away from the Soldier?s body to reduce the probability of Soldier detection from battlefield thermal sensors while integrating other key garment performance requirements; continue to mature and demonstrate additional topical applications using engineered optical materials within binder agents to conceal exposed skin (i.e., face, hands) from thermal sensors; collect imagery data of Soldiers and squad formations against ground and aerial sensor threats in multiple bands of the electromagnetic spectrum to assess highest impact improvement opportunities; apply newly developed aided target detection techniques against Soldier camouflage and concealment capabilities to assess Soldier detectability capability gaps against emerging threat sensors and sensor platform.</p> <p>FY 2023 Plans: Will mature materials specifically designed to reduce the radar cross section of individual Soldiers and their equipment from detection by ground surveillance radar threats; integrate and demonstrate passive ground surveillance radar threat detection capability into the Soldier?s equipment to provide early threat detection and warning; attain and collect imagery data of Soldiers and squad formations against ground and aerial sensor threats to validate ground-force vulnerabilities in multiple bands of the electromagnetic spectrum against sensor threats to assess high impact camouflage and concealment opportunities; exploit and demonstrate aided target detection algorithms and provide vulnerability analysis of Soldier camouflage and concealment capabilities to support continued assessment of Soldier signature capability gaps.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.108	-
Accomplishments/Planned Programs Subtotals		1.605	2.969	3.084
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) AZ6 / <i>Soldier Signature Management Advanced Technology</i>

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BB3 / <i>Dismounted Soldier Survivability Equip/Tech Integ</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB3: <i>Dismounted Soldier Survivability Equip/Tech Integ</i>	-	1.238	3.026	3.458	-	3.458	3.522	3.518	3.519	3.518	0.000	21.799
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates the integration of Soldier survivability materials and technologies to increase the speed and efficiency of dismounted Soldier movement and maneuver. This Project focuses on reducing Soldier-worn equipment weight, improving Soldier and system integration and reducing the dismounted Soldier's detectability, susceptibility, and vulnerability to operational threats. Operational threats are characterized as combat threats (e.g., flame and thermal, blast and ballistic, multispectral sensors, and laser threats), environmental threats (e.g., cold, heat, wet, vector, water contamination, concealment, etc.), and Soldier system components and system limitations (e.g., size, weight, and bulk). This Project includes the demonstration and validation of integrated technologies, novel subsystems/ systems, and test methods.

This Project complements work done in Program Element (PE) 0602143A (Soldier Lethality Technology) / Project BB4 (Dismounted Soldier Survivability Materials).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Dismounted Soldier Survivability Equipment and Technology Integration	1.238	2.915	3.458
Description: This effort matures and integrates multifunctional protective materials, sub-components, and systems for field demonstrations to significantly increase the survivability of Soldiers through their multi-functional clothing and individual protective equipment. This effort also demonstrates and validates tradeoff analyses in sub-component and system-level designs of ballistic, blast, signature management and integrated protection clothing and equipment technologies.			
FY 2022 Plans: Will mature and optimize the systems engineering architecture, framework and physical demonstrator units that demonstrate integrated body-worn Soldier survivability technologies for Soldier user assessments in support of the Combat Protective Ensemble (CAPE) program; validate combat ensemble components that address gaps in extremities protection, thermal management, and moisture control through optimizing operational clothing and individual equipment for (1) temperate to extreme cold climates and (2) temperate to extreme heat and high humidity environments; exploit recent advancements in power and data transfer mechanisms to mature multiple candidate modular load management systems integrating body-worn power and			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BB3 / <i>Dismounted Soldier Survivability Equip/Tech Integ</i>
--	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>data distribution to optimize the Soldier system integration of body-worn individual equipment with particular focus on system level weight reduction and enhanced ergonomics to greatly improve Soldier ability to shoot, move and communicate; validate and demonstrate maturing candidate camouflage and concealment materials from PE 0602143A (Soldier Lethality Technology) with a focus on visible through infrared bands of the electromagnetic spectrum; validate and demonstrate maturing high performance materials for integrated and modular ballistic and blast protection from PE 0602143A (Soldier Lethality Technology) against anti-personnel munitions and small arms threats.</p> <p>FY 2023 Plans: Will demonstrate an improved load-management system that integrates body-worn individual equipment, power and data distribution network, hydration system, and torso protection to greatly improve Soldier lethality and maneuverability; mature enhancements in the combat ensemble that provide greater situational awareness of battlefield threats in (1) temperate to extreme cold environments and (2) temperate to extreme heat and high humidity environments to optimize Soldier readiness to shoot, move and communicate; perform Soldier user assessments of integration of matured camouflage and concealment materials from PE 0602143A (Soldier Lethality Technology) and modular ballistic and blast protection from PE 0602143A (Soldier Lethality Technology) against anti-personnel munitions and small arms threats to evaluate compatibility with matured and optimized systems-engineering architecture for Soldier ensembles in support of the CAPE program.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding changes reflect planned life cycle of effort.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.111	-
Accomplishments/Planned Programs Subtotals	1.238	3.026	3.458

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

Remarks

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BB3 / <i>Dismounted Soldier Survivability Equip/Tech Integ</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BB6 / <i>Physical Augmentation: Adv Tech for Field Demo</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>BB6: Physical Augmentation: Adv Tech for Field Demo</i>	-	2.865	-	-	-	-	-	-	-	-	0.000	2.865
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project investigates human augmentation technologies for enhanced Soldier mobility & lethality to provide an advantage over adversaries during close combat and infantry tasks. This will be achieved by demonstrating and validating operationally ready physical augmentation systems that meet the mission requirements by optimizing movement & maneuver and logistics sustainment task performance.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
<i>Title:</i> Wearable Assistive Devices Advanced Technology for Feld Demo	2.865	-	-
<i>Description:</i> This effort demonstrates wearable physical augmentation devices to validate Soldier metrics such as endurance, survivability, speed, and strength, as well as system metrics such as power consumption and duration, actuator and controller performance, and integration with Soldier clothing and individual equipment (CIE). Results will demonstrate if the Army will benefit from leveraging industry investments and determine if these systems enhance Soldier mobility and lethality in operational environments.			
Accomplishments/Planned Programs Subtotals	2.865	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BB8 / <i>Soldier Centric Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB8: <i>Soldier Centric Advanced Technology</i>	-	5.622	5.292	2.391	-	2.391	1.880	-	-	-	0.000	15.185
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates an optimized training systems to enable effective training and provide increased levels of Soldier proficiency and readiness. This Project matures and demonstrates Soldier centric technologies for the Soldier/Squad virtual environment to support the Army's Synthetic Training Environment (STE). The STE is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight with, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. The Soldier/Squad virtual environment combines and integrates several individual Soldier and Squad training capabilities, STE Squad Capability (SSC), Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF), into a single capability that can be conducted simultaneously or individually and enable physical movement/exertion related to the execution of Soldier/Marine individual and Squad collective training tasks. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: STE Soldier/Squad Virtual Trainer	5.622	5.099	2.391
Description: This effort matures and demonstrates a common battle drill squad-level mixed reality based system that allows for the rapid conduct and repetition of squad-level training. The training system will make it possible to conduct diverse, repeatable and effective training without extensive training infrastructure. This effort matures and demonstrates novel and realistic training environments that provide increased levels of proficiency and readiness through immersive training scenarios conducted at the point of need.			
FY 2022 Plans: Will mature device agnostic camera and tracking technologies required for dynamic occlusion to successfully perform in all potential training environments; validate technologies that enhance immersion (haptic suits, three-dimensional (3D) sound,			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BB8 / <i>Soldier Centric Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
etc.) for Soldier training in mixed reality environments; improve performance of weapon tracking algorithms by utilizing better processing technologies and deep learning algorithms using markerless tracking. FY 2023 Plans: Will demonstrate the performance of agnostic camera and tracking technologies required for dynamic occlusion to perform in daylight training environments successfully; improve individual Soldier position- and orientation-tracking; demonstrate multi-modal, Soldier interfaces (e.g., haptic suits, 3D sound, acoustics, etc.) for individual Soldiers in live training environments. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease supports shift to long-term objectives of merging live and synthetic training.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.193	-
Accomplishments/Planned Programs Subtotals	5.622	5.292	2.391

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BC1 / <i>Human Performance AdvTech for Mobility & Lethality</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC1: <i>Human Performance AdvTech for Mobility & Lethality</i>	-	12.207	13.944	9.415	-	9.415	6.986	7.374	7.325	7.321	0.000	64.572
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures technologies, methodologies, and human performance models to demonstrate increased mobility and lethality of the individual and small unit to achieve overmatch. It validates and integrates human performance assessment methods and algorithms into training/education, test and evaluation methodologies, and materiel solutions to compare performance impacts between different materiel and non-materiel solutions to maximize the individual Warfighter and small unit. These methods and algorithms have potential to enable the development of aspects of doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) improvements and efficiencies. This Project also uses Soldier assessments to iteratively improve the performance of, optimize, and integrate technologies to augment Soldier function (e.g. shoot, move, perceive, decide, and communicate) during missions for maximizing performance. This Project supports the Measuring and Advancing Soldier Tactical Readiness and Effectiveness (MASTR-E) Science and Technology program supported by the Office of the Secretary of Defense Close Combat Lethality Task Force.

This Project supports key Army needs and complements the technical research of Program Element (PE) 0602143A (Soldier Lethality Technology) / Project BC6 (Human Perf-Tech for Warfighter Enhancement) and project BC2 (Next Gen Mobility & Lethality Tech for Warfighters). This research is also supported by and fully coordinated with efforts conducted by Medical Research & Development Command (MRDC), Army Research Institute (ARI), U.S. Military Academy (USMA), and other academic and industry partners. This research is in partnership with Forces Command (FORSCOM) operational units and the appropriate Training and Doctrine Command (TRADOC) organizations as well as established transition partners, including Army Test and Evaluation Command (ATEC) & Program Executive Office-Soldier (PEO-S). This Project also complements and is fully coordinated with work performed across Army, Navy, and Air Force under the Reliance 21 Human Systems Community of Interest: Systems Interfaces & Cognitive Processes and Protection, Sustainment, and Warfighter Performance.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Close Combat Lethality Task Force, the Army Modernization Strategy and supports the Soldier Lethality Cross Function Team (CFT) efforts.

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Soldier/Squad Performance Metrics for Lethality	5.152	4.468	-
Description: This effort validates and matures technologies, methodologies, and human performance models to demonstrate increased Soldier and Small Unit mobility & lethality to achieve overmatch. The effort validates and integrates human performance sensors, models, and design guidance into training/education, test and evaluation, and materiel. The results of this work will allow			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC1 / <i>Human Performance AdvTech for Mobility & Lethality</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>the Army to develop equipment, systems and training devices that maximize the close combat Soldier and small unit performance in multi-domain operations.</p> <p>FY 2022 Plans: Will demonstrate an instrumented test bed (squad Situational Training Exercise lane and Shoot House) for the evaluation of Soldier and small unit mobility and lethality; utilizing the test bed, demonstrate the linkages between individual technical performance measures, measures of performance, and squad measures of effectiveness under controlled conditions to optimize repeatability and reliability; train and validate predictive performance algorithms in relevant environments; demonstrate down-selected machine learning performance algorithms developed in PE 0602143A (Soldier Lethality Technology) in multidimensional human performance datasets (such as the 72-hr mission field study).</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This effort ends in Fiscal Year 2022 (FY22).</p>				
<p>Title: Operational Unit Partnership and Soldier Touch Point</p> <p>Description: This effort optimizes innovation through Science and Technology touch points with the Operational force, resulting in rapid iteration, concept maturation, integration, validation of laboratory findings, and transition of technologies and methodologies in response to operational unit demand signal. This effort streamlines demonstration, data collection, and technology maturation for near term DOTMLPF solutions, enabling faster delivery of materiel and non-materiel products/knowledge refined with direct Soldier input. This body of work allows validated, empirical, assessment of any equipment capability or training intervention as part of the Soldier architecture to inform future acquisition investments, training, and operational trade space decisions.</p> <p>FY 2022 Plans: Will conduct small and large scale field studies to fully mature dataset to train and validate human performance algorithms and analyze findings and data sets from expert and novice units performing mission essential tasks in realistic, constructive tactical environments; provide and advance a front end solution to access and visualize database elements; demonstrate human performance data visualization tools to increase situational awareness and improve decision making.</p> <p>FY 2023 Plans: Will conduct field and simulation studies to validate prediction models (previously trained with human performance data) in relevant environments/scenarios under realistic operational states (e.g., high stress, thermal load, dehydration, sleep restriction, etc.) in order to evaluate the correspondence between predictions and performance outcomes; conduct field studies testing the effectiveness of enhancement strategies on close combat performance outcomes and readiness.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>		7.055	8.965	9.415

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC1 / <i>Human Performance AdvTech for Mobility & Lethality</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding change reflects planned lifecycle of this effort.				
Title: FY2022 SBIR/STTR Transfer		-	0.511	-
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		12.207	13.944	9.415
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BC4 / <i>Soldier Decision Making&Comms Performance AdvTech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC4: <i>Soldier Decision Making&Comms Performance AdvTech</i>	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project integrates research, theory and applied operations to maximize effectiveness of Soldiers and their equipment. Efforts in this Project support early application of Human Systems Integration (HSI) during Advanced Technology Development by translating research findings into performance-based prototype subsystem, component, and software interface design criteria for use in the Army's requirements definition process and materiel acquisition process for Army Modernization. Application of this work will yield reduced workload, fewer errors, reduced task times, enhanced Soldier protection, user acceptance, and allow the Soldier to extract maximum performance from the equipment. Representative major efforts address Soldier cognitive load and cognitive fusion research, advanced aircraft design to include flight in degraded visual environments, and development of human performance measures and methods to address current and future human system integration challenges. Individual efforts exploit adaptive learning methods and strategies, applied methods to accelerate expertise development, integration of displays for ease of use and optimized situational awareness, and development of technical frameworks for crew automation integration in Command and Control Systems (C2). Efforts also support flight crew decision-aiding and autonomy, advanced crew station design for aircraft, full mission operations in degraded visual environments, and advanced manned-unmanned teaming concepts.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Human System Integration Demonstration	1.925	-	-
Description: This effort provides early front end analysis and assessment for HSI in Army systems acquisition to influence Advanced Technology Development and prototype design specifications. Research findings translate into performance-based design specifications and human performance analyses for use in the Army's requirements definition process, training development, and materiel acquisition process. Results of these efforts provide quantified, data-driven analysis on the value of applying HSI early in Army technology development and systems acquisition and are transitioned to technology developers, evaluators, and other Advanced Technology Development stakeholders to include the Future Vertical Lift and Air Missile Defense Program Offices, TRADOC, and the ATEC.			
Accomplishments/Planned Programs Subtotals	1.925	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC4 / <i>Soldier Decision Making&Comms Performance AdvTech</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BC8 / <i>Training Advanced Technology (Other than STE)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC8: <i>Training Advanced Technology (Other than STE)</i>	-	4.140	2.993	7.078	-	7.078	7.650	10.289	23.443	31.277	0.000	86.870
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced training technologies in support of the Army's need for simulations that accurately replicate and realistically represent the effects of current and future weapons systems during live and synthetic training. Integration of the live and synthetic environments into a single synthetic training environment will modernize the current Live Training Environment and allow fair fight engagements across all training environments and training devices.

This Project complements work done in Program Element (PE)0602143A (Soldier Lethality Technology) / Project BC7 (Training Technology (Other than STE)).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: STE: Live Training Applications	4.140	2.884	-
Description: This effort exploits technology to demonstrate enhanced fidelity of live training systems and develops future live training capabilities for conducting force-on-force, combined arms exercises to enhance readiness at Army home stations and Combat Training Centers.			
FY 2022 Plans: Will mature and demonstrate software algorithms that calculate weapon orientation or position for direct or indirect fire weapons based on a number of different sensor inputs (e.g. inertial, computer vision, Light Detection and Ranging (LIDAR)); improve the size, weight, and power consumption of the Weapon Orientation Module; demonstrate a matured position tracking capability suitable for crew served indirect fire weapons.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects a shift in research focus from the near term development of the STE capabilities to the support technologies necessary to enable more realistic live-synthetic training where and when it is needed with lower cost.			
Title: Advanced Processing Technologies for Live Training	-	-	3.969

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC8 / <i>Training Advanced Technology (Other than STE)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort will improve technologies that reduce the computational burden, latency, and power consumption (battery weight) associated with training dismounted Soldiers in live training environments that leverage simulated tactical engagements. Such live training use-cases require virtual ballistic flyout calculations, casualty assessment, and visualization of terminal effects (e.g., munition impacts).</p> <p>FY 2023 Plans: Will demonstrate methods to couple lethality, vulnerability, and terrain models with real-world sensors to generate realistic virtual ballistic flyout and casualty assessment models that reduce weight and functional impacts to the Soldier; validate architectures to account for truncated calculation space, data compression, parallelization, 3D terrain tiling, high-speed commercial hardware, and smart RF network packet routing.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects a shift in research focus from the near term development of the Synthetic Training Environment (STE) capabilities to the support technologies necessary to enable more realistic live-synthetic training where and when it is needed with lower cost.</p>				
<p>Title: Synthetic Cyberspace Effects for Training</p> <p>Description: This effort matures, demonstrates, and validates a data exchange model for cyberspace effects and a brokering architecture to propagate those cyberspace effects across Live, Virtual and Constructive models and simulations within distributed training environments for collective training.</p> <p>FY 2023 Plans: Will mature cyberspace data model and effects brokering architecture to incorporate cyber, electronic warfare, and Global Positioning System (GPS) effects for Brigade-level collective training; validate multi-domain use-cases and identify large-scale exercises to leverage for data collection and demonstration.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort to progress into advanced technology development from the Cyberspace Electromagnetic Activities (CEMA) Effects Modeling and Simulation task in PE 0602143A (Soldier Lethality Technology) / BC7 (Training Technology (Other than STE)).</p>		-	-	3.109
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans:</p>		-	0.109	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC8 / <i>Training Advanced Technology (Other than STE)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	4.140	2.993	7.078

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BC9 / <i>Adv Soldier Sensors/Displays AdvTech for Dismounts</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC9: <i>Adv Soldier Sensors/Displays AdvTech for Dismounts</i>	-	8.738	13.151	25.963	-	25.963	27.040	26.606	28.425	28.937	0.000	158.860
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, optimizes, and demonstrates fully digital sensor systems, architectures, and interfacing capabilities to fuse sensors, and network situational understanding information and targeting capabilities to enable maintained mounted and dismounted visual advantage, increased situational awareness, decreased fratricide, and decreased response times to all threats in all environments.

Research in this Project supports the Army Science and Technology Soldier Lethality, Next Generation Combat Vehicle, and Future Vertical Lift Army Modernization priorities.

This Project complements work done in Program Element (PE) 0602143A (Soldier Lethality Technology) / BD1 (Advanced Soldier Sensors/Displays Tech for Dismounts).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Soldier Lethality Cross Functional Team (CFT).

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Soldier Sensors/Displays Advanced Technology for Dismounts	8.738	12.671	25.963
Description: This effort will mature and demonstrate low cost Soldier-borne situational understanding systems with greater fidelity for improved maneuver and lethality, as well as integrates automated target cueing to increase probability of recognition/identification and tracking of threats in all environments.			
FY 2022 Plans: Will improve performance of augmented reality (AR) systems for mounted/mechanized infantry interactions by providing heading corrections and providing self-location to infantry within a combat vehicle; mature sensor systems and integrate with command and control systems for information sharing capabilities between dismounted and mounted Soldiers on a tactical vehicle platform; mature novel sensor payloads with enhanced processing to improve detection, localization and notification capabilities required			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC9 / <i>Adv Soldier Sensors/Displays AdvTech for Dismounts</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>for improved situational awareness against all threats; optimize performance of sensors to enable effective range of threats, and framerates required for dismounted hostile fire detection; mature opto-acoustic techniques to enable dismounted multi-modal hostile fire detection.</p> <p>FY 2023 Plans: Will mature advanced infrared sensors leveraging emerging multiple sensor modalities for incorporation into various soldier borne sensor systems; mature covert eye tracking, parallax correction and multi-plane display technologies to enable the next generation of digital sensor and head mounted display capabilities for dismounted Soldier situational awareness and mobility; improve performance of optics detection capability against concealed infrared threats while reducing size and weight for small platform use; optimize sensor approaches enabling low false alarms, stand-off range, signature reduction, and threat location accuracy; demonstrate AR systems for mounted infantry interactions with heading corrections and self-location capabilities within a combat vehicle while on the move; optimize sensor systems integrated with command and control systems for information sharing capabilities between dismounted and mounted Soldiers on a tactical vehicle platform for soldier touchpoint assessment on representative platforms; optimize sensor payloads and processing approaches for enhanced autonomy to enable target localization and notification capabilities on smaller aerial platforms enabling improved situational awareness against all threats; optimize performance of image processing techniques to improve threat detection at longer ranges, and frame rates required for dismounted hostile fire detection; validate optical and acoustic techniques to enable dismounted multi-modal hostile fire detection.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase represents funding for technology maturation needed to leverage breakthroughs in sensors and sensor fusion and inject them into critical dismounted Soldier systems.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.480	-
Accomplishments/Planned Programs Subtotals		8.738	13.151	25.963
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BC9 / <i>Adv Soldier Sensors/Displays AdvTech for Dismounts</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BD7 / <i>Soldier Sys Interfaces/Integration-Sensor AdvTech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BD7: <i>Soldier Sys Interfaces/Integration-Sensor AdvTech</i>	-	9.110	8.374	8.535	-	8.535	8.196	8.590	9.311	9.309	0.000	61.425
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will integrate and mature technologies for sensing, processing, displaying information, interfacing with users, and cognitive improvement to enhance Soldier & Small Unit situational awareness & understanding. This Project will integrate and demonstrate battlefield, body-worn sensors, and data fusion algorithms to provide the dismounted Small Unit leader with clear, actionable information for making well informed, rapid, tactical decisions. This Project will also mature and integrate advanced dismounted Soldier robotic and autonomous systems technologies to demonstrate autonomous navigation, manned-unmanned teaming, and networked reconnaissance to improve Soldier lethality, situational awareness, and survivability during tactical operations.

Research in this Project complements several Program Elements (PEs) and Projects to include PE 0602143A (Soldier Lethality Technology) / BD6 (Soldier Sys Interfaces/Integration - Sensor Tech), Project BB9 (Human Performance Tech for Mobility & Lethality), and PE 0603118A (Soldier Lethality Advanced Technology) / Project BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Soldier Lethality Cross Functional Team (CFT).

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Soldier System Interfaces & Integration (Sensor Advanced Technology)	9.110	8.068	8.535
Description: This effort will integrate battlefield and body-worn sensors and mature data-fusion algorithms to provide the dismounted Small Unit leader with clear, actionable information to make well informed, rapid, tactical decisions. This effort will mature and integrate advanced dismounted Soldier robotic and autonomous systems technologies to demonstrate autonomous navigation, manned-unmanned teaming, and networked reconnaissance to improve Soldier lethality, situational awareness, and survivability during tactical operations.			
FY 2022 Plans: Will mature and integrate Small Unit leader planning and decision tools, human performance algorithms and visualization tools, and Soldier equipment sensing algorithms and user interfaces; conduct field demonstrations of integrated Soldier sensor systems with Nett Warrior and the Integrated Visual Augmentation System (IVAS) in relevant field environments to validate performance			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BD7 / <i>Soldier Sys Interfaces/Integration-Sensor AdvTech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>and operation; demonstrate advanced autonomous tactical Small Unmanned Aerial Systems (SUAS) capabilities (ie. collision avoidance, fast flight, nighttime navigation, target detection) on representative military platforms in relevant field environments to validate the performance and operation of the technologies; mature technologies to enable hasty resupply of consumable items found in an infantry squad basic load for the Multi Domain Operations (MDO) battlespace.</p> <p>FY 2023 Plans: Will mature and demonstrate Small Unit leader planning tools with the IVAS to enhance tactical decision making; mature and integrate human performance, Soldier equipment, and remote sensing capabilities with IVAS to enhance Soldier situational awareness & understanding during distributed operations; conduct field demonstrations of Sensored Soldier technologies with IVAS, Soldier Lethality, and other Army systems in relevant operational environments to validate performance and functionality; mature autonomous tactical algorithms for Army SUAS (e.g., nighttime navigation, perch and stare, landing site selection) and integrate them on military relevant platforms; demonstrate SUAS autonomy capabilities in relevant field environments to validate the performance and operation of the technologies; integrate and demonstrate small unit logistical planning tools that support data driven decisions for emergency and routine resupply at the tactical edge while conducting cross domain maneuver.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.306	-
Accomplishments/Planned Programs Subtotals		9.110	8.374	8.535
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BD9 / <i>Soldier & Sm Unit Tactical Energy AdvTech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BD9: <i>Soldier & Sm Unit Tactical Energy AdvTech</i>	-	6.041	3.171	4.189	-	4.189	4.269	4.520	4.518	4.517	0.000	31.225
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will demonstrate advanced Power and Energy (P&E) technologies for the dismounted Soldier to lighten equipment load, reduce resupply need, and enhance mobility. This Project will conduct Soldier and Small Unit power and energy technology maturation, integration with clothing and individual equipment, technical analysis, and operational assessment.

Work in this Project complements several Program Elements (PEs) to include PE 0602143A (Soldier Lethality Technology) / project BD6 (Soldier Sys Interfaces/ Integration - Sensor Tech), Project BB9 (Human Performance Tech for Mobility & Lethality), Project BD8 (Soldier & Sm Unit Tactical Energy Tech), and PE 0603118A (Soldier Lethality Advanced Technology) / Project BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Soldier Lethality Cross Functional Team (CFT).

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Dismounted Soldier Power and Energy	3.141	3.055	4.189
<p>Description: This effort matures, integrates, and demonstrates advanced Soldier P&E technologies that are used to power the dismounted Soldier and small unit's command and control, communications, computers, and sensor devices during tactical operations. This work will result in the Army being able to provide the power and energy the future Soldier requires to operate effectively, while doing so at a reduced physical burden.</p> <p>FY 2022 Plans: Will mature, integrate, and demonstrate technologies for increasing the run-time of rechargeable battery technologies for the Soldier's weapon, body, or helmet electronics; conduct field demonstrations to validate the performance and operation of batteries to support operational Soldier materiel; mature, integrate, and demonstrate novel power management technologies for transferring power efficiently between electronic components resident on the Soldier's head, body, or weapon; mature and demonstrate Soldier power generation technologies for recharging batteries during a Platoon Level dismounted mission.</p> <p>FY 2023 Plans:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BD9 / <i>Soldier & Sm Unit Tactical Energy AdvTech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will optimize technologies to efficiently transfer power between the conformal wearable battery and the Soldier's weapon to recharge the weapon battery during dismounted operations; mature technologies to improve the safety and increase the energy density of Soldier carried rechargeable batteries; mature Soldier carried power generators to increase efficiency, reduce weight, and improve compatibility with Soldier equipment; conduct field demonstrations to validate the performance and operation of Soldier and Squad power technologies; mature and validate a Soldier worn, portable data-acquisition system to accurately measure power and energy metrics during Soldier field evaluations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects anticipated efforts to mature more efficient power generators for the Soldier and Squad to meet the increasing power demand on the Soldier.</p>				
<p>Title: Sustainment Technologies for Expeditionary Power</p> <p>Description: Sustainment Technologies for Expeditionary Power (STEP) is an innovation approach to engaging with industry to solve some of the toughest Army problems statements for projecting Army energy sources into an expeditionary environment. STEP utilizes a cohort approach to rapidly identify promising solutions that industry offers and pairs them with Army subject matter experts and Soldiers in the field.</p>		2.900	-	-
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.116	-
Accomplishments/Planned Programs Subtotals		6.041	3.171	4.189
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BE2 / <i>Joint Service Combat Feeding Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE2: <i>Joint Service Combat Feeding Advanced Technology</i>	-	2.367	2.424	1.988	-	1.988	2.019	2.016	2.121	2.120	0.000	15.055
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates combat ration and field feeding technologies to optimize Warfighter performance, decrease the risk of exposure to chemical and biological contaminants in foods, and reduce the logistics burden to enable semi-independent operations. The Army serves as the Executive Agent for this Department of Defense (DoD) program, with oversight and coordination provided by the DoD Combat Feeding Research and Engineering Board.

This Project matures and demonstrates research done in Program Element (PE) 0602143A (Soldier Lethality Technology) / Project BE3 (Joint Service Combat Feeding Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Joint Service Combat Feeding Advanced Technology Demonstration	2.367	2.335	1.988
Description: This effort matures and demonstrates combat ration and field feeding technologies to optimize Warfighter performance, decrease risk of exposure to chemical and biological contaminants in foods, and reduce the logistics burden to enable semi-independent operations.			
FY 2022 Plans: Will validate critical limits for multispectral imaging to identify potential quality degradation of ration components; optimize field-deployable biosensor detection platforms for multiple pathogens in food matrices to reduce risk of food-borne illness on the battlefield; demonstrate baseline Close Combat Assault Ration effect on Warfighter physical performance to enable semi-independent operations; validate decontamination agent performance on ration packaging in support of Chemical Biological Radiological Nuclear (CBRN) threats; validate effects of cycling temperatures and processing methods on nutrient compounds in ration components to ensure nutrient retention during processing and prolonged storage; validate small scale atmospheric water harvester performance to decrease logistical burdens in multi-domain operations; and validate conductive materials performance during heating and sterilization processing methods to enhance ration heating efficiency.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BE2 / <i>Joint Service Combat Feeding Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate field-deployable biosensor detection platforms for multiple pathogens in food matrices to reduce risk of food-borne illness on the battlefield; validate effect of Close Combat Assault Ration on Warfighter physical performance to enable semi-independent operations; optimize commercially available surface treatment chemicals for mobile field feeding kitchen surfaces to improve force health protection; demonstrate stability and safety of membrane concentrate technology to reduce combat load; continue optimization of small scale atmospheric water harvester performance using an environmental chamber technique to decrease logistical burdens in multi-domain operations; and mature and demonstrate additive manufacturing technology to provide targeted nutrition-on-demand for optimal physical performance.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned to PE 0602143A (Soldier Lethality Technology) / Project BE3 (Joint Service Combat Feeding Technology). Funding decrease will enable future maturation and demonstration of combat ration and field feeding technologies.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.089	-
Accomplishments/Planned Programs Subtotals		2.367	2.424	1.988
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BE5 / <i>Personnel & Airdrop Safety Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE5: <i>Personnel & Airdrop Safety Advanced Technology</i>	-	5.707	6.879	6.484	-	6.484	6.603	6.668	7.306	7.304	0.000	46.951
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates equipment and innovative techniques for precision aerial delivery of cargo and personnel. Technologies support Army Modernization Priority, Soldier Lethality. Aerial delivery is a key capability for rapid force projection and global precision delivery to support the mission readiness profile for Global Response Force (GRF). These efforts are designed to advance state of the art precision delivery technologies such as parachutes; guidance, navigation, and control (GNC) components and subsystems; tracking sensors; software algorithms; and safety rigging that integrates with currently equipped aircraft, unmanned aerial systems (UAS), and advanced rotary wing aircraft. These efforts provide the Warfighter with highly accurate, timely cargo/payload delivery and resupply in all terrain and weather conditions. Precision delivery/resupply reduces vulnerability of ground Soldiers, aircraft, and aircrew. Precision aerial delivery supports remote warfare with activities such as placement of battlefield sensors and reduction of Soldier load.

Research in this Project supports key Army needs and complements the technical research in Program Element (PE) 0602143A (Soldier Lethality Technology) / Project BR9 (Personnel & Airdrop Safety Technology). This Project also complements research done in the Science & Technology Precision, Navigation and Timing 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.

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Personnel & Airdrop Safety Advanced Technology	5.707	6.628	6.484
Description: This effort matures and demonstrates parachute materials and designs, precision guidance, navigation software and hardware, tracking sensors, and safety devices to increase the accuracy of delivering cargo to remote locations and/or complex terrains in global positioning system (GPS) denied environments. This effort also provides technologies that increase safety during personnel insertions into theaters of operation. This effort supports capability demonstrations for mitigating the Army's challenge of overburdened Soldiers through the use of tactical aerial resupply technologies, as well as supporting Anti-Access/Area Denial (A2/ AD) and manned-unmanned teaming (MUM-T) operational concepts by demonstrating airdrop from non-traditional platforms.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BE5 / <i>Personnel & Airdrop Safety Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Will optimize heavy equipment airdrop system performance to minimize altitude loss and increase system reliability. Will demonstrate capabilities to airdrop up to at least 50,000 lbs through live airdrop testing from a C-17 aircraft. Will demonstrate advancements in high altitude insertion technology that facilitate extended offset insertions in GPS denied conditions. Will mature Next Generation Static Line parachute systems and demonstrate effectiveness in Immediate Response Force (IRF) mission. Will optimize the design of an autonomously guided powered aerial resupply system with a minimum of tenfold increase in horizontal standoff capability compared to conventional guided airdrop systems.</p> <p>FY 2023 Plans: Optimize and demonstrate integration of low-cost suite of guidance, navigation, and control sensors, to enable robust positioning estimates in GPS denied conditions; demonstrate and validate sensor integration on an autonomously guided aerial resupply system, in operationally relevant environment; incrementally mature and demonstrate autonomous technologies on personnel infiltration/exfiltration systems (PIES) in live environment, with both dependent and autonomous controls; demonstrate Next Generation Static Line (NGSL) advancements in control authority in a live environment that reflects IRF challenges.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.251	-
Accomplishments/Planned Programs Subtotals	5.707	6.879	6.484

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>				Project (Number/Name) BE9 / <i>STE Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE9: <i>STE Advanced Technology</i>	-	14.764	13.401	10.656	-	10.656	3.658	3.022	0.929	0.948	0.000	47.378
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies supporting the Army's Synthetic Training Environment (STE). The STE is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight with, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. STE Information Systems (STE-IS) delivers the Common Synthetic Environment consisting of Global Terrain/One World Terrain (OWT), Training Simulation Software (TSS), and Training Management Tools (TMT). The STE will be available where training occurs (home station, combat training centers, armories, institutions, shipboard, deployed) and will include Air and Ground Reconfigurable Virtual Collective Trainers (RVCTs), a Soldier/Squad Virtual Training (S/SVT), and a live training capability. The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, including Live and Constructive. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle.

This Project complements research done in Program Element (PE) 0602143A (Soldier Lethality Technology) / Project BE8 (Synthetic Training Environment (STE) Technology).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the STE Cross Functional Team efforts.

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: STE Training Management Tool	3.371	3.187	2.897
Description: This effort matures and demonstrates STE-relevant tools and technologies that automatically adapt training to the learner's skill level, conduct intelligent after action reviews, automate team training assessments, and enable the visualization of and interaction with a Mixed Reality Common Operating Picture of the battlespace.			
FY 2022 Plans: Will exploit the association between squad level performance measures for individuals and teams and optimize how to best provide instructors with data to assess their performance and readiness; mature generalized intelligent tutoring framework allowing for both individual and team tutoring capabilities within synthetic training environments; demonstrate a team competency			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BE9 / <i>STE Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
tracking capability that utilizes Department of Defense learning architecture standards; validate battlespace visualization tools to support large-scale simulations with synthetic training environments and mission command decision making. FY 2023 Plans: Will demonstrate the integration of automated performance measures from both live and simulated small-unit training events in a team-competency tracking architecture that uses Department of Defense standards; optimize models and algorithms to measure squad-level competencies for integration into the STE; exploit human-performance data and demonstrate dashboards that visualizes competency acquisition over time and across multiple training interactions; mature and demonstrate the integration between competency tracking architecture and visualization tools for small-unit after-action review and for Multi-Domain Operations mission planning and mission command at higher echelons. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects the planned lifecycle of this effort through a shift in research focus from the near-term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.				
Title: STE One World Terrain Description: This effort matures and demonstrates tools and methods that improve the speed, fidelity and delivery of synthetic terrain and environmental data needed to support mission rehearsal and training in a representation of the globe, fully accessible through the Army network and usable by all simulation trainers. This effort also matures and develops complex representations (including megacities and subterranean) of the operational environment and the Multi-Domain battlefield in synthetic training environments. FY 2022 Plans: Will demonstrate processes, tools and software for surface level feature classification and extraction for material and terrain artifacts to support OWT application spaces for the resulting modernized three-dimensional (3-D) terrain products; improve attribution deficiencies for OWT; demonstrate runtime implementation optimizations to rapidly assemble tailored terrain datasets suitable for application-specific needs; improve methods to procedurally correct or validate 3-D terrain data; optimize the OWT data model specification to support traditional and non-traditional application domains FY 2023 Plans: Will demonstrate processes, tools and software for surface indentation, classification and extraction for material and terrain artifacts supporting the ability to access, explore, modify, and retrieve 3-D content from the OWT 3-D Foundational Data; establish processes and standards to balance the tradespace of enterprise (unconstrained) vs. point-of-need (constrained) terrain needs		2.816	2.805	4.294

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BE9 / <i>STE Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
conforming to network design and constraint space such as how much content should be pre-loaded vs. on-demand; demonstrate automation across the 3-D terrain generation pipeline to accelerate ground-truth 3-D content delivery. FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase will provide and demonstrate processes and tools that could enable OWT content and applications beyond training use-cases.				
Title: STE Training Simulation Software Description: This effort matures and demonstrates technologies that support Multi-Domain Operations modeling and simulation configuration and scalability technologies for collective training. In addition, matures and demonstrates technologies that allow the synthesis of robust military behaviors that enable the scaling of STE collective training configurations and delivery to the Point of Need through the exploitation of emerging computing and networking technologies that optimize computing architectures for integrating components (models, behaviors, data, etc.) of the Training Simulation Software (TSS). FY 2022 Plans: Will mature and demonstrate the integration of simulation architecture technologies that allow for components (models, behaviors, data, etc.) to be dynamically integrated to support collective training use cases; will demonstrate technologies to generate STE-ready behavior models from authoritative sources to facilitate reuse and reduce the cost of TSS development; will improve Operational Environment (OE) models in support of emerging TSS gaps from collective training use cases; will demonstrate emerging AI techniques to represent military behaviors against OE modeling needs. FY 2023 Plans: Will demonstrate dynamic integration of STE-simulation components (models, behaviors, data, etc.) in a point-of-need collective-training use case featuring local and distributed simulation; mature and demonstrate Operational Environment models (e.g., Areas, Structures, Capabilities, Organizations, People, Events [ASCOPE]/Political, Military, Economic, Social, Information, Infrastructure- Physical environment and Time [PMESII-PT]) to enhance the representation of Multi-Domain Operations in Army simulations. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects a shift in research focus from the near-term development of the STE capabilities to longer-term research supporting training of multi-domain operations on complex, data-intensive battlefields.		5.752	6.950	3.465
Title: Weapons Effects for STE Description: This effort matures and demonstrates structural weapon effects and projectile penetration models and algorithms to integrate within the Army's STE. This effort provides One World Terrain with accurate representation of the effects of threat		0.851	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BE9 / <i>STE Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
weapons (such as small arms, projectiles, indirect fire, and improvised explosives device attacks) and display of realistic vulnerabilities in the battlespace.				
Title: Live Training Thin Client Engagement and Casualty Assessment		1.974	-	-
Title: FY2022 SBIR/STTR Transfer		-	0.459	-
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		14.764	13.401	10.656
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BS8 / <i>Soldier Lethality Advanced Technology</i>
--	--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>BS8: Soldier Lethality Advanced Technology</i>	-	45.200	44.500	-	-	-	-	-	-	-	0.000	89.700
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
Congressional Interest Item funding provided for Soldier Lethality Advanced Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Soldier Lethality Advanced Technology.

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 2021	FY 2022
<i>Congressional Add:</i> Program Increase - Advanced AI/AA Analytics for Modernization and Readiness	10.000	10.000
<i>FY 2021 Accomplishments:</i> Conducted advanced research in Advanced AI/AA Analytics for Modernization and Readiness. Work executed by Army Futures Command.		
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Advanced AI/AA Analytics for Modernization and Readiness		
<i>Congressional Add:</i> Program Increase - Small Arms Fire Control Advanced Technology	8.000	8.000
<i>FY 2021 Accomplishments:</i> Conducted advanced research in Small Arms Fire Control Advanced Technology. Work executed by Army Futures Command.		
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Small Arms Fire Control Advanced Technology		
<i>Congressional Add:</i> Program Increase: Advanced Technology for Maneuver Support and Protection	10.000	-
<i>FY 2021 Accomplishments:</i> Conducted advanced research in Maneuver Support and Protection. Work executed by Army Futures Command.		
<i>Congressional Add:</i> Program Increase - Military Engineering Technology for Infield Waste	2.000	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BS8 / <i>Soldier Lethality Advanced Technology</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022
FY 2021 Accomplishments: Conducted advanced research in Military Engineering Technology for Infield Waste. Work executed by Army Futures Command.			
Congressional Add: Program Increase - Flexible LED Lighting for Tents and Shelters FY 2021 Accomplishments: Conducted advanced research in Flexible LED Lighting for Tents and Shelters. Work executed by Army Futures Command.		5.200	-
Congressional Add: Program Increase FY 2021 Accomplishments: Conducted advanced research in Soldier Lethality Advanced Technology. Work executed by Army Futures Command.		10.000	-
Congressional Add: Ferrium Steel for Improved Personal Protective Equipment FY 2022 Plans: Congressional Interest Item funding provided for Ferrium Steel for Improved Personal Protective Equipment		-	5.000
Congressional Add: Human Machine Teaming FY 2022 Plans: Congressional Interest Item funding provided for Human Machine Teaming		-	4.000
Congressional Add: Impact Attenuation Materials for Limb Protection FY 2022 Plans: Congressional Interest Item funding provided for Impact Attenuation Materials for Limb Protection		-	1.500
Congressional Add: Soldier Situational Awareness FY 2022 Plans: Congressional Interest Item funding provided for Soldier Situational Awareness		-	8.000
Congressional Add: Squad Operations Advanced Resupply FY 2022 Plans: Congressional Interest Item funding provided for Squad Operations Advanced Resupply		-	8.000
Congressional Adds Subtotals		45.200	44.500
C. Other Program Funding Summary (\$ in Millions)			
N/A			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603118A / <i>Soldier Lethality Advanced Technology</i>	Project (Number/Name) BS8 / <i>Soldier Lethality Advanced Technology</i>

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

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603119A / Ground Advanced Technology
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	196.055	280.490	32.546	-	32.546	33.403	39.922	40.631	46.023	0.000	669.070
BK8: Robotics for Engineer Operations Adv Tech	-	4.194	6.221	6.314	-	6.314	3.784	4.523	6.500	8.179	0.000	39.715
BK9: Ground System Fluids and Fuels Adv Tech	-	1.684	1.732	2.301	-	2.301	2.752	3.063	3.150	3.099	0.000	17.781
BL3: Explosives Forensics Advanced Technology	-	2.002	2.096	2.214	-	2.214	2.246	2.267	2.267	2.267	0.000	15.359
BL6: Expedient Passive Protection Advanced Technology	-	3.051	0.494	3.613	-	3.613	5.998	5.821	4.154	4.773	0.000	27.904
BL8: Power Projection in A2AD Environments Adv Tech	-	1.220	2.970	4.948	-	4.948	3.302	4.101	2.660	3.699	0.000	22.900
BM1: Protection from Advanced Weapon Effects Adv Tech	-	2.104	5.868	4.856	-	4.856	4.915	5.103	5.302	5.490	0.000	33.638
BO3: MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)	-	181.800	257.100	-	-	-	-	-	-	-	0.000	438.900
CJ9: Ground Enabling University Adv Development	-	-	4.009	3.896	-	3.896	4.195	6.002	6.097	6.095	0.000	30.294
CV5: Engineer Enablers Maneuver, LOG, & Sustainment Adv	-	-	-	2.539	-	2.539	3.298	4.781	2.183	3.586	0.000	16.387
DA2: SAFR Alternatives for Readiness Advanced Tech	-	-	-	1.865	-	1.865	2.913	4.261	5.199	5.509	0.000	19.747
DB8: Center for Mobile Power and Energy Adv Research*	-	-	-	-	-	-	-	-	3.119	3.326	0.000	6.445

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

Note

Project CV5 (Engineer Enablers Maneuver, LOG, & Sustainment Adv) and Project DA2 (SAFR Alternatives for Readiness Advanced Tech) are New Starts in Fiscal Year 2023 (FY23).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>
---	---

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates ground movement and maneuver technologies that support and enable the Army's modernization priority for the Next Generation of Combat Vehicles. This PE also matures, integrates and demonstrates advanced technologies that are necessary and foundational for legacy and future ground platforms and ground maneuver. These technology areas include: robotic and autonomous Army Combat Engineer equipment, liquid logistics (i.e., fuels, lubricants, and oils) and related monitoring and distribution, forensic analysis of explosives and other chemical materials, rapidly deployable passive protection technologies, entry and maneuver assessment technologies and structural hardening technologies to protect personnel and critical assets from advanced weapon effects.

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

Research is performed by the United States (U.S.) Army Futures Command and the U.S. Army Engineer Research and Development Center.

Research in this PE complements PE 0602144A (Ground Technology), PE 0602145A (Next Generation Combat Vehicle Technology), and PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	196.055	23.403	0.000	-	0.000
Current President's Budget	196.055	280.490	32.546	-	32.546
Total Adjustments	0.000	257.087	32.546	-	32.546
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	257.100			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	32.546	-	32.546
• FFRDC Transfer	-	-0.013	-	-	-

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

Project: BO3: *MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)*

Congressional Add: *Electrical System Safety and Reliability*

Congressional Add: *Cold Regions Research*

Congressional Add: *High-Performance Concrete Technology*

	FY 2021	FY 2022
	5.000	5.000
	2.000	2.000
	6.000	6.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity	R-1 Program Element (Number/Name)		
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	PE 0603119A / Ground Advanced Technology		
Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2021	FY 2022	
Congressional Add: <i>Secure Management of Energy Generation and Storage</i>	5.000	5.000	
Congressional Add: <i>Composite Flywheel Technology</i>	7.000	7.000	
Congressional Add: <i>Robotic Construction Equipment</i>	5.000	-	
Congressional Add: <i>Environmental Sensors for Explosives</i>	3.000	-	
Congressional Add: <i>Robotic 4-D Printing of Geopolymer-Based Composites</i>	2.000	-	
Congressional Add: <i>Materials and Manufacturing Technology for Cold Environments</i>	4.000	4.000	
Congressional Add: <i>Research Facility Modernization</i>	6.000	-	
Congressional Add: <i>Program Increase - Smart Installation and Community Program</i>	5.000	-	
Congressional Add: <i>Program Increase - Flow Battery Demonstration</i>	20.000	-	
Congressional Add: <i>Program Increase - Corrosion Protection and Prevention</i>	10.000	-	
Congressional Add: <i>Program Increase - Rapid Entry and Sustainment for the Arctic</i>	8.000	8.000	
Congressional Add: <i>Program Increase - Secure Management of Energy Generation and Storage</i>	5.000	-	
Congressional Add: <i>Program Increase - Water Quality and Resiliency</i>	5.000	5.000	
Congressional Add: <i>Program Increase - Rare Earth Element Extraction</i>	5.000	-	
Congressional Add: <i>Program Increase - Organic Light Emitting Diode</i>	5.000	5.000	
Congressional Add: <i>Program Increase - Coatings Technology</i>	5.000	-	
Congressional Add: <i>Program increase - Heavy Load Simulator</i>	4.200	-	
Congressional Add: <i>Program Increase - Integrated Microgrids</i>	4.000	-	
Congressional Add: <i>Program Increase - Infrastructure Resilience and Flood Assessment</i>	3.000	3.500	
Congressional Add: <i>Program Increase - Single Connection Quick Oil Change System</i>	3.000	-	
Congressional Add: <i>Program Increase - Clean Modular Hydro Technology</i>	4.000	8.000	
Congressional Add: <i>Program Increase - Accelerator Technology for Ground Maneuver</i>	5.000	5.000	
Congressional Add: <i>Program increase - Autonomous Combat Engineering Solutions</i>	5.500	4.000	
Congressional Add: <i>Program Increase - Coastal Terrain Hazard Research</i>	8.000	6.000	
Congressional Add: <i>Program Increase - Expeditionary Deployment of Fully Sustainable Utility</i>	10.000	-	
Congressional Add: <i>Program Increase - Graphene Research</i>	5.000	-	

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>
---	---

Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add: <i>Program Increase - Impacts of Soil Structures on Hydrology</i>	4.000	5.000
Congressional Add: <i>Program Increase - Operational Energy Research</i>	1.300	-
Congressional Add: <i>Program Increase - Temperature Insensitive High Energy Density Lithium Ion Batteries</i>	2.500	-
Congressional Add: <i>Program Increase - Vehicle Performance Reliability and Operations</i>	3.000	-
Congressional Add: <i>Program Increase - Cross-Laminated Timber and Recycled Carbon Fiber Materials</i>	1.300	5.500
Congressional Add: <i>Program Increase - Advanced Explosion Resistant Window Systems</i>	5.000	-
Congressional Add: <i>3D Printing of Concrete</i>	-	2.000
Congressional Add: <i>3D Printing of Infrastructure</i>	-	5.000
Congressional Add: <i>Additive Construction for Field Deployment</i>	-	4.000
Congressional Add: <i>Anticipating Threats to Natural Systems</i>	-	5.000
Congressional Add: <i>Army Visual and Tactical Arctic Reconnaissance</i>	-	2.000
Congressional Add: <i>Assessments and Monitoring Systems for Historic Structures</i>	-	5.000
Congressional Add: <i>Autonomous Construction and Manufacturing</i>	-	5.000
Congressional Add: <i>Biofuel</i>	-	6.000
Congressional Add: <i>Biomass Polymer Technology</i>	-	2.000
Congressional Add: <i>Cold Weather Energy Research</i>	-	5.000
Congressional Add: <i>Cold Weather Research</i>	-	3.000
Congressional Add: <i>Distributed Technologies for Steam Loop Replacements</i>	-	5.000
Congressional Add: <i>Electrochemical Conversion of Water Streams</i>	-	5.000
Congressional Add: <i>Entry Control Points at Installations</i>	-	5.000
Congressional Add: <i>Expeditionary Additive Construction</i>	-	15.000
Congressional Add: <i>Explosive Materials Detection</i>	-	3.000
Congressional Add: <i>Frost Heave Effects Monitoring</i>	-	4.500
Congressional Add: <i>Graphene Applications for Military Engineering</i>	-	10.000
Congressional Add: <i>Hardened Facility Standards</i>	-	4.600
Congressional Add: <i>High Power Fast Charging for Electric Vehicle Fleets</i>	-	3.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>
---	---

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

	FY 2021	FY 2022
Congressional Add: <i>Infrastructure Smart Technology</i>	-	5.000
Congressional Add: <i>Low Carbon Hydrogen Technologies</i>	-	10.000
Congressional Add: <i>Microgrid Reliability and Resiliency</i>	-	10.000
Congressional Add: <i>Military Waste Stream Conversion</i>	-	5.000
Congressional Add: <i>Partnership and Technology Transfer</i>	-	4.000
Congressional Add: <i>Power Generation for Increased Facility Resilience Pilot</i>	-	10.000
Congressional Add: <i>Power Projection</i>	-	7.000
Congressional Add: <i>Sustainable Smart Utilities</i>	-	5.000
Congressional Add: <i>Water Resiliency and Self Sufficiency</i>	-	4.000
Congressional Add: <i>Water Reuse Consortium</i>	-	10.000
Congressional Add: <i>Watercraft Simulator</i>	-	4.000
Congressional Add Subtotals for Project: BO3		257.100
Congressional Add Totals for all Projects		181.800

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BK8 / <i>Robotics for Engineer Operations Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BK8: <i>Robotics for Engineer Operations Adv Tech</i>	-	4.194	6.221	6.314	-	6.314	3.784	4.523	6.500	8.179	0.000	39.715
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates robotic engineer equipment capabilities that can remotely characterize the environment and operate in the battlespace for autonomous Combat Engineer actions. This Project provides technologies for Combat Engineer mission planning, creating or reducing barriers and obstacles, as well as maintaining, repairing, and constructing expedient infrastructure. These efforts will enhance Combat Engineer missions of mobility, counter mobility, and survivability through semi-autonomous or autonomous operations.

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

Research in this Project supports the Army Science and Technology Ground Portfolio.

Research is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project is related to, and fully coordinated with Program Element (PE) 0602144A (Ground Technology) / Project BK7 (Robotics for Engineer Operations Technology).

Research in this PE complements PE 0602114A (Ground Technology), PE 0602145A (Next Generation Combat Vehicle Technology), and PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Beyond-Visual-Line-of-Sight Tele-operated Engineer Operations Demonstration	4.194	5.994	6.314
Description: This effort matures and demonstrates remote control and semi-autonomous behaviors on small scale construction equipment to provide information that scales to larger legacy equipment as well as assess the applicability of small scale equipment working in collaboration and coordination.			
FY 2022 Plans: Demonstrate autonomous Engineer site characterization with a semantically labeled site model and change detection; demonstrate compact track loader and mini-hydraulic excavator performing Combat Engineer tasks at Beyond-Visual-Line-of-			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BK8 / <i>Robotics for Engineer Operations Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Sight (BVLOS) standoff distances to support mobility and maneuver; demonstrate a universal controller developed by Combat Capability Development Center Ground Vehicle Systems Center for Combat Engineer equipment.</p> <p>FY 2023 Plans: Will demonstrate operator assist capabilities for BVLOS execution of a Combat Engineer task. Will validate capabilities for autonomous Engineer site characterization and BVLOS teleoperation of multiple pieces of heavy Engineer equipment in a Joint exercise supporting Multi-Domain Operations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>			
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.227	-
Accomplishments/Planned Programs Subtotals	4.194	6.221	6.314

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BK9 / <i>Ground System Fluids and Fuels Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BK9: <i>Ground System Fluids and Fuels Adv Tech</i>	-	1.684	1.732	2.301	-	2.301	2.752	3.063	3.150	3.099	0.000	17.781
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates liquid logistics technologies such as enhanced jet fuels, lubricants, oils, powertrain fluids, coolants, bulk fluid treatment, monitoring, metering, storage, and distribution in support of established Army regulations and requirements. This Project improves products and technologies to optimize fuel efficiency, meet new hardware fluid requirements, modernize fluids, ensure bulk fluid meets quality requirements, and provide bulk fluid asset visibility, to optimize logistics and reduce logistics requirements. This Project executes the demonstration of enhanced jet fuels for ground systems, gear oils, anti-lock brake system - compatible brake fluid, smart bulk fuel metering and monitoring technologies. This Project improves liquid logistics products and technologies that are critical enablers for multi-domain operations requiring semi-independent operations to enable dispersed operations to extend operational reach, prolong endurance and allow freedom of action for the Joint Force.

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

Research in this Project supports the Army Science and Technology Ground Portfolio.

Research is performed by the United States (U.S.) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Ground System Fluids and Fuels	1.684	1.668	2.301
Description: This effort focuses on reducing the logistics footprint, improving fuel efficiency, and ensuring mobility by maturing and demonstrating technologies in areas such petroleum quality monitoring, filtration, storage and distribution, hydraulic fluids; enhanced jet fuels and fuel additives, lubricants, oil, powertrain fluids and coolants.			
Validates additional candidate synthetic fuel blends to determine their suitability for military ground systems.			
Validates candidate fuel efficient gear oils that maintain and improve vehicle axle durability and provide extended performance time over current gear oil for military use. Provide performance requirements for a new military brake fluid that is compatible with anti-lock braking system (ABS) and investigate candidate fluid technologies. Integrate smart fuel metering technology into self-correcting devices that automatically report fuel quantity and conduct fuel filter effectiveness testing to establish fuel particle contamination limits for new fuel monitoring technology.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BK9 / <i>Ground System Fluids and Fuels Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Will continue assessment of the lubrication capacity of fuel additive using improved methods and component test rigs for the initial fuel pump selected to optimize wear reduction of fuel delivery system components. Will conduct fuel injector testing based on the results of the fuel filter effectiveness testing to establish fuel particle contamination limits for new fuel monitoring technology. Will develop criteria and laboratory methodology to assess extended life and performance capabilities of coolants.</p> <p><i>FY 2023 Plans:</i> Will correlate fuel lubricity additive concentration to fuel injection pump performance from the bench scale through test rig evaluation to full engine demonstrations for improved durability and operation using aviation fuels. Complete enhanced performance engine coolant candidate fluid testing and candidate down selection. Conduct testing to evaluate and establish smart meter performance baseline and initiate effort to transfer data via the server to a fuel dashboard.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Increase investment in fuel metering to provide fuel asset visibility and predictive logistics.</p>			
<p><i>Title:</i> FY2022 SBIR/STTR Transfer</p> <p><i>Description:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>	-	0.064	-
Accomplishments/Planned Programs Subtotals	1.684	1.732	2.301

<p><u>C. Other Program Funding Summary (\$ in Millions)</u> N/A</p> <p><u>Remarks</u></p> <p><u>D. Acquisition Strategy</u> N/A</p>
--

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BL3 / <i>Explosives Forensics Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BL3: <i>Explosives Forensics Advanced Technology</i>	-	2.002	2.096	2.214	-	2.214	2.246	2.267	2.267	2.267	0.000	15.359
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates instrumentation and algorithms required to provide improved point, proximity, and stand-off detection of explosives and precursor materials to enable the warfighter to integrate chemical and explosive hazard detection equipment. This Project integrates explosive detection into the family of Chemical, Biological, Radiological, and Nuclear point and stand-off sensors, alternative chemical detection modalities and algorithms that will improve the probability of detection and attribution of an explosive hazard or Home-made Explosive manufacturing/assembly location.

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

Research in this Project supports the Army Science and Technology Ground Portfolio.

Research is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with the U.S. Army Futures Command.

Research in this Project is related to, and fully coordinated with Program Element (PE) 0602144A (Ground Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Detection Mechanisms for Contaminants	2.002	2.020	2.214
Description: This effort matures and demonstrates improved point and standoff detection of military and homemade explosives and their precursors, and other chemicals and hazardous materials.			
FY 2022 Plans: Will further mature novel portable detection technology for further maturity and testing of realistic threats and scenarios. Will continue maturation of photonic integrated circuit (PIC) for chemical sensing to decrease size, weight and power configuration footprint.			
FY 2023 Plans: Will demonstrate improved point and standoff detection of military homemade explosives and other chemical threats to facilitate chemical explosives reconnaissance focusing on integration to unmanned ground platforms. Will evaluate integrated systems for			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BL3 / <i>Explosives Forensics Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
semi-autonomous trace level detection of surface threats and vapor phase explosive and chemical threats. Will integrate maturing technologies in hyperspectral imaging, portable mass spectrometry, and advanced optical methodologies for sensor development. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.076	-
Accomplishments/Planned Programs Subtotals	2.002	2.096	2.214

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>			Project (Number/Name) BL6 / <i>Expedient Passive Protection Advanced Technology</i>				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BL6: <i>Expedient Passive Protection Advanced Technology</i>	-	3.051	0.494	3.613	-	3.613	5.998	5.821	4.154	4.773	0.000	27.904
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates rapidly deployable protection solutions to protect small distributed units; decision support applications and software; and tactics, techniques, and procedures to increase the survivability of personnel, critical assets, and facilities from a range of threats. Force protection technologies will be matured and demonstrated for applications in complex and urban environments to protect against advanced energetic threats, large caliber rockets and missiles, and other emerging weapons.

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

Research in this Project supports the Army Science and Technology Ground portfolio.

Research in this Project conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project is related to and fully coordinated with Program Element (PE) 0602144A (Ground Technology) / Project BL5 (Expedient Passive Protection Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Force Protection in the Urban Environment Demonstrations	3.051	-	-
Description: This effort matures and demonstrates force protection solutions for urban environments focusing on the use of existing structures; rapidly deployable protection systems; decision support applications and software; and tactics, techniques, and procedures to provide protection with consideration for a complex three-dimensional threat.			
Title: Protection Against High Trajectory Large Caliber Rocket and Missile Threats	-	0.476	-
Description: This effort matures and demonstrates expedient force protection solutions for emerging threats such as large caliber rocket and missile weapon effects. This effort also demonstrates decision support tools to aid the warfighter in selecting protection schemes for survivability from emerging threats supporting All-Domain/Multi-Domain Operations.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BL6 / <i>Expedient Passive Protection Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Assess capabilities of legacy protective systems to protect critical assets and facilities from emerging threat weapon system effects such as large caliber rockets and missiles to establish baseline performance. FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned based on completion of the baseline assessment phase and shift to Assessments of Solutions for Survivability from Emerging Threats (ASSET) Demonstrations effort in this project reflecting a planned shift in focus to include both legacy and newly developed expedient force protection solutions for emerging threats.				
Title: Assessments of Solutions for Survivability from Emerging Threats Demonstrations Description: This effort matures and demonstrates both legacy and newly developed expedient force protection solutions for emerging threats such as large caliber rocket and missile weapon effects and UAV threats. This effort also demonstrates algorithms for decision support applications and software; and inform tactics, techniques, and procedures (TTP's) to increase the survivability of personnel, critical assets, and facilities against emerging threats to enable the Warfighter to select protection schemes for survivability from emerging threats supporting Multi-Domain Operations. FY 2023 Plans: Will mature and demonstrate rapidly deployable protection systems (expedient barriers, expedient personnel shelters, and expeditionary bunkers) to protect critical semi-fixed assets and facilities from emerging threats such as large caliber rockets and missiles to establish baseline performance so these systems can be optimized to provide tailored protection. FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned to demonstrate passive protection capabilities developed in PE 0602144A (Ground Technology) / Project BL5 (Expedient Passive Protection Technology).		-	-	3.613
Title: FY 2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.018	-
Accomplishments/Planned Programs Subtotals		3.051	0.494	3.613
C. Other Program Funding Summary (\$ in Millions)				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BL6 / <i>Expedient Passive Protection Advanced Technology</i>
C. Other Program Funding Summary (\$ in Millions)		
Remarks N/A		
D. Acquisition Strategy N/A		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BL8 / <i>Power Projection in A2AD Environments Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BL8: <i>Power Projection in A2AD Environments Adv Tech</i>	-	1.220	2.970	4.948	-	4.948	3.302	4.101	2.660	3.699	0.000	22.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates remote assessment technologies to determine entry and maneuver corridors, provides site selection tools and decision support technologies for all climates in all season conditions including aviation site- selection tools, enhanced automated route reconnaissance technologies, mobility models for extreme climates, and road capacity assessment technologies. These technologies reduce reliance on manned on-site reconnaissance for force projection assessments and provide all-season predictions to ensure air and ground battlespace entry and maneuver. This Project also matures and demonstrates material solutions to repair, rebuild, and construct infrastructure required for movement and maneuver in highly contested, complex operational environments such as Anti-Access/Area Denial.

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

Research in this Project supports the Army Science and Technology Ground portfolio.

Research in this Project conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with the U.S. Army Futures Command.

Research in this Project is related to and fully coordinated with Program Element (PE) 0602144A (Ground Technology) / Project BL7 (Power Projection in A2AD Environments Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Entry and Sustainment in Complex Contested Environments Demonstrations	1.220	1.522	3.312
Description: This effort matures and demonstrates geospatial planning tools to expand engineering analysis of ground surfaces for entry, sustainment, and maneuver operations and to automate processes for selecting suitable maneuver corridors.			
FY 2022 Plans: Mature and demonstrate reconnaissance techniques and mobility algorithms for maneuver in arctic regions; and demonstrate advanced analysis methods for classifying low-volume roads and predicting deterioration under military vehicle loadings.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BL8 / <i>Power Projection in A2AD Environments Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature and demonstrate planning capabilities for predicting route deterioration from military ground vehicles; will demonstrate methods for assessing ground mobility across snow-covered terrain and thawing arctic soils to inform Army tactics, techniques, and procedures (TTP).</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase provides for the final year of demonstration events for this effort completing in Fiscal Year 2023.</p>				
<p>Title: Engineering for Battlespace Maneuver Demonstrations</p> <p>Description: This effort demonstrates material solutions and techniques for expedient repair to rapidly repair and upgrade damaged infrastructure along mobility corridors and restaging areas to maintain and enhance freedom of maneuver achieving overmatch and tactical advantage in contested complex environments.</p> <p>FY 2022 Plans: Will demonstrate techniques for rapid soil stabilization to support military ground vehicle maneuver; and will demonstrate tactics, techniques, and procedures as well as material solutions for rapid infrastructure capacity upgrades.</p> <p>FY 2023 Plans: Will demonstrate effectiveness of material additives for stabilizing reclaimed pavement materials; will mature and demonstrate equipment solutions for expedient road repair.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>		-	1.340	1.636
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.108	-
Accomplishments/Planned Programs Subtotals		1.220	2.970	4.948
C. Other Program Funding Summary (\$ in Millions)				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BL8 / <i>Power Projection in A2AD Environments Adv Tech</i>

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

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BM1 / <i>Protection from Advanced Weapon Effects Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BM1: <i>Protection from Advanced Weapon Effects Adv Tech</i>	-	2.104	5.868	4.856	-	4.856	4.915	5.103	5.302	5.490	0.000	33.638
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates structural hardening solutions and force protection technologies to increase survivability of facilities and provide critical updates to protective design specifications and guidance. Additionally, this project matures and demonstrates passive protection technologies and provides protective design criteria advancements to mitigate attack from emerging advanced threats.

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

Research in this Project supports the Army Science and Technology Ground portfolio.

Research in this Project is conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This Project is related to and fully coordinated with Program Element (PE) 0602144A (Ground Technology) / Project BL9 (Protection from Advanced Weapon Effects Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Defeat of Complex Attack Demonstrations	2.104	5.654	4.856
Description: This effort demonstrates force protection technologies that mitigate the effects of emerging peer and near peer adversaries advanced penetrating threats and high yield blast effects by optimizing high-performance, logistically feasible material solutions and processes.			
FY 2022 Plans: Demonstrate optimized subscale hardening solutions against emerging complex weapon attack scenarios; and optimize damage prediction and system performance for full-scale demonstration.			
FY 2023 Plans: Will demonstrate full scale structural hardening solution against emerging complex weapon attack scenario. Will demonstrate enhanced algorithm for structural hardening and damage prediction from peer and near peer adversaries' precision strike penetrating weapons.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BM1 / <i>Protection from Advanced Weapon Effects Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding decrease reflects planned lifecycle of this effort completing in Fiscal Year 2023.			
Title: FY 2022 SBIR/STTR Transfer	-	0.214	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	2.104	5.868	4.856

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BO3: <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>	-	181.800	257.100	-	-	-	-	-	-	-	0.000	438.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Military Engineering Technology Demonstration.

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 2021	FY 2022
Congressional Add: Electrical System Safety and Reliability	5.000	5.000
FY 2021 Accomplishments: Program Increase supported advanced research on Electrical System Safety and Reliability. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Electrical System Safety and Reliability		
Congressional Add: Cold Regions Research	2.000	2.000
FY 2021 Accomplishments: Program Increase supported advanced research on Cold Regions Research. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Cold Weather Research Station		
Congressional Add: High-Performance Concrete Technology	6.000	6.000
FY 2021 Accomplishments: Program Increase supported advanced research on High-Performance Concrete Technology. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for High-Performance Concrete		
Congressional Add: Secure Management of Energy Generation and Storage	5.000	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<p>FY 2021 Accomplishments: Program Increase supported advanced research on Secure Management of Energy Generation and Storage.</p> <p>Work executed by Army Futures Command.</p> <p>FY 2022 Plans: Congressional Interest Item funding provided for Secure Management of Energy Generation and Storage</p>		
<p>Congressional Add: Composite Flywheel Technology</p> <p>FY 2021 Accomplishments: Program Increase supported advanced research on Composite Flywheel Technology.</p> <p>Work executed by Army Futures Command.</p> <p>FY 2022 Plans: Congressional Interest Item funding provided for Composite Flywheel Technology</p>	7.000	7.000
<p>Congressional Add: Robotic Construction Equipment</p> <p>FY 2021 Accomplishments: Program Increase supported advanced research on Robotic Construction Equipment</p> <p>Work executed by Army Futures Command.</p>	5.000	-
<p>Congressional Add: Environmental Sensors for Explosives</p> <p>FY 2021 Accomplishments: Program Increase supported advanced research on Environmental Sensors for Explosives.</p> <p>Work executed by Army Futures Command.</p>	3.000	-
<p>Congressional Add: Robotic 4-D Printing of Geopolymer-Based Composites</p> <p>FY 2021 Accomplishments: Program Increase supported advanced research on Robotic 4-D Printing of Geopolymer-Based Composites.</p> <p>Work executed by Army Futures Command.</p>	2.000	-
<p>Congressional Add: Materials and Manufacturing Technology for Cold Environments</p>	4.000	4.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
FY 2021 Accomplishments: Conduct advanced research in Materials and Manufacturing Technology for Cold Environments. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Materials and Manufacturing Technology for Cold Environments		
Congressional Add: Research Facility Modernization FY 2021 Accomplishments: Program Increase supported advanced research on Research Facility Modernization. Work executed under the direction of the Army Futures Command.	6.000	-
Congressional Add: Program Increase - Smart Installation and Community Program FY 2021 Accomplishments: Program Increase supported advanced research on Smart Installation and Community Program. Work executed by Army Futures Command.	5.000	-
Congressional Add: Program Increase - Flow Battery Demonstration FY 2021 Accomplishments: Program Increase supported advanced research on Flow Battery Demonstration. Work executed by Army Futures Command.	20.000	-
Congressional Add: Program Increase - Corrosion Protection and Prevention FY 2021 Accomplishments: Program Increase supported advanced research on Corrosion Protection and Prevention. Work executed by Army Futures Command.	10.000	-
Congressional Add: Program Increase - Rapid Entry and Sustainment for the Arctic FY 2021 Accomplishments: Program Increase supported advanced research on Rapid Entry and Sustainment for the Arctic.	8.000	8.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Rapid Entry and Sustainment for the Arctic		
Congressional Add: Program Increase - Secure Management of Energy Generation and Storage FY 2021 Accomplishments: Program Increase supported advanced research on Secure Management of Energy Generation and Storage.	5.000	-
Work executed by Army Futures Command. Congressional Add: Program Increase - Water Quality and Resiliency FY 2021 Accomplishments: Program Increase supported advanced research on Water Quality and Resiliency.	5.000	5.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Water Quality and Resiliency Technologies Congressional Add: Program Increase - Rare Earth Element Extraction FY 2021 Accomplishments: Program Increase supported advanced research on Rare Earth Element Extraction.	5.000	-
Work executed by Army Futures Command. Congressional Add: Program Increase - Organic Light Emitting Diode FY 2021 Accomplishments: Program Increase supported advanced research on Organic Light Emitting Diode.	5.000	5.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Organic Light Emitting Diode Congressional Add: Program Increase - Coatings Technology FY 2021 Accomplishments: Program Increase supported advanced research on Coatings Technology.	5.000	-
Work executed by Army Futures Command. Congressional Add: Program increase - Heavy Load Simulator FY 2021 Accomplishments: Program Increase supported advanced research on Heavy Load Stimulator.	4.200	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Integrated Microgrids FY 2021 Accomplishments: Program Increase supported advanced research on Integrated Microgrids.	4.000	-
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Infrastructure Resilience and Flood Assessment FY 2021 Accomplishments: Program Increase supported advanced research on Infrastructure Resilience and Flood Assessment.	3.000	3.500
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Infrastructure Resilience and Flood Assessment		
Congressional Add: Program Increase - Single Connection Quick Oil Change System FY 2021 Accomplishments: Program Increase supported advanced research on Single Connection Quick Oil Change System.	3.000	-
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Clean Modular Hydro Technology FY 2021 Accomplishments: Program Increase supported advanced research on Clean Modular Hydro Technology.	4.000	8.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Clean Modular Hydro Technology.		
Congressional Add: Program Increase - Accelerator Technology for Ground Maneuver FY 2021 Accomplishments: Program Increase supported advanced research on Accelerator Technology for Ground Maneuver.	5.000	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Accelerator Technology for Ground Maneuver		
Congressional Add: Program increase - Autonomous Combat Engineering Solutions FY 2021 Accomplishments: Program Increase supported advanced research on Autonomous Combat Engineering Solutions.	5.500	4.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Autonomous Combat Engineering Solutions		
Congressional Add: Program Increase - Coastal Terrain Hazard Research FY 2021 Accomplishments: Program Increase supported advanced research on Coastal Terrain Hazard Research.	8.000	6.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Coastal Terrain Hazard Research		
Congressional Add: Program Increase - Expeditionary Deployment of Fully Sustainable Utility FY 2021 Accomplishments: Program Increase supported advanced research on Expeditionary Deployment of Fully Sustainable Utility.	10.000	-
Work executed by Army Futures Command. Congressional Add: Program Increase - Graphene Research FY 2021 Accomplishments: Program Increase supported advanced research on Graphene Research.	5.000	-
Work executed by Army Futures Command. Congressional Add: Program Increase - Impacts of Soil Structures on Hydrology FY 2021 Accomplishments: Program Increase supported advanced research on Impacts of Soil Structures on Hydrology.	4.000	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Impacts of Soil Structures on Hydrology		
Congressional Add: Program Increase - Operational Energy Research	1.300	-
FY 2021 Accomplishments: Program Increase supported advanced research on Operational Energy Research.		
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Temperature Insensitive High Energy Density Lithium-Ion Batteries	2.500	-
FY 2021 Accomplishments: Program Increase supported advanced research on Temperature Insensitive High-Energy Density Lithium-Ion Batteries.		
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Vehicle Performance Reliability and Operations	3.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Vehicle Performance Reliability and Operations.		
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Cross-Laminated Timber and Recycled Carbon Fiber Materials	1.300	5.500
FY 2021 Accomplishments: Program Increase supported advanced research on Cross-Laminated Timber and Recycled Carbon Fiber Materials.		
Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Cross-Laminated Timber and Recycled Carbon Fiber Materials		
Congressional Add: Program Increase - Advanced Explosion Resistant Window Systems	5.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Advanced Explosion Resistant Window Systems.		
Work executed by Army Futures Command.		
Congressional Add: 3D Printing of Concrete	-	2.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for 3D Printing of Concrete		
<i>Congressional Add:</i> 3D Printing of Infrastructure	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for 3D Printing of Infrastructure		
<i>Congressional Add:</i> Additive Construction for Field Deployment	-	4.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Additive Construction for Field Deployment		
<i>Congressional Add:</i> Anticipating Threats to Natural Systems	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Anticipating Threats to Natural Systems		
<i>Congressional Add:</i> Army Visual and Tactical Arctic Reconnaissance	-	2.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Army Visual and Tactical Arctic Reconnaissance		
<i>Congressional Add:</i> Assessments and Monitoring Systems for Historic Structures	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Assessments and Monitoring Systems for Historic Structures		
<i>Congressional Add:</i> Autonomous Construction and Manufacturing	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Autonomous Construction and Manufacturing		
<i>Congressional Add:</i> Biofuel	-	6.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Biofuel		
<i>Congressional Add:</i> Biomass Polymer Technology	-	2.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Biomass Polymer Technology		
<i>Congressional Add:</i> Cold Weather Energy Research	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Cold Weather Energy Research		
<i>Congressional Add:</i> Cold Weather Research	-	3.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Cold Weather Research		
<i>Congressional Add:</i> Distributed Technologies for Steam Loop Replacements	-	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Distributed Technologies for Steam Loop Replacements		
<i>Congressional Add:</i> Electrochemical Conversion of Water Streams	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Electrochemical Conversion of Water Streams		
<i>Congressional Add:</i> Entry Control Points at Installations	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Entry Control Points at Installations		
<i>Congressional Add:</i> Expeditionary Additive Construction	-	15.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Expeditionary Additive Construction		
<i>Congressional Add:</i> Explosive Materials Detection	-	3.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Explosive Materials Detection		
<i>Congressional Add:</i> Frost Heave Effects Monitoring	-	4.500
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Frost Heave Effects Monitoring		
<i>Congressional Add:</i> Graphene Applications for Military Engineering	-	10.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Graphene Applications for Military Engineering		
<i>Congressional Add:</i> Hardened Facility Standards	-	4.600
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Hardened Facility Standards		
<i>Congressional Add:</i> High Power Fast Charging for Electric Vehicle Fleets	-	3.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for High Power Fast Charging for Electric Vehicle Fleets		
<i>Congressional Add:</i> Infrastructure Smart Technology	-	5.000
<i>FY 2022 Plans:</i> Infrastructure Smart Technology		
<i>Congressional Add:</i> Low Carbon Hydrogen Technologies	-	10.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Low Carbon Hydrogen Technologies		
<i>Congressional Add:</i> Microgrid Reliability and Resiliency	-	10.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) BO3 / <i>MILITARY ENGINEERING TECHNOLOGY DEMONSTRATION (CA)</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
FY 2022 Plans: Congressional Interest Item funding provided for Microgrid Reliability and Resiliency		
Congressional Add: Military Waste Stream Conversion	-	5.000
FY 2022 Plans: Congressional Interest Item funding provided for Military Waste Stream Conversion		
Congressional Add: Partnership and Technology Transfer	-	4.000
FY 2022 Plans: Congressional Interest Item funding provided for Partnership and Technology Transfer		
Congressional Add: Power Generation for Increased Facility Resilience Pilot	-	10.000
FY 2022 Plans: Congressional Interest Item funding provided for Power Generation for Increased Facility Resilience Pilot		
Congressional Add: Power Projection	-	7.000
FY 2022 Plans: Congressional Interest Item funding provided for Power Projection		
Congressional Add: Sustainable Smart Utilities	-	5.000
FY 2022 Plans: Congressional Interest Item funding provided for Sustainable Smart Utilities		
Congressional Add: Water Resiliency and Self Sufficiency	-	4.000
FY 2022 Plans: Congressional Interest Item funding provided for Water Resiliency and Self Sufficiency		
Congressional Add: Water Reuse Consortium	-	10.000
FY 2022 Plans: Congressional Interest Item funding provided for Water Reuse Consortium		
Congressional Add: Watercraft Simulator	-	4.000
FY 2022 Plans: Congressional Interest Item funding provided for Watercraft Simulator		
Congressional Adds Subtotals	181.800	257.100

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) CJ9 / <i>Ground Enabling University Adv Development</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CJ9: Ground Enabling University Adv Development</i>	-	-	4.009	3.896	-	3.896	4.195	6.002	6.097	6.095	0.000	30.294
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Project matures and demonstrates advanced developments and technological innovations from academia, in the focus areas of ground autonomy, Artificial Intelligence / Machine Learning (AI/ML) and robotics, occupant/vehicle survivability and other ground platform technologies of importance to the Army, by maturing and demonstrating technologies with the goal of delivering technology to the warfighter more quickly. This Project matures and demonstrates advanced technologies with a focus on mid to far-term Army modernization priorities while also maintaining delivery of near-term technologies critical to the next generation combat vehicles. This Project focuses on maturation and demonstration of various advanced technologies originating from extramural applied research in academia pertaining to navigation/ routing, autonomous robotic vehicles with the use of artificial intelligence and machine learning as applied to ground mobility and maneuver, and other innovative ground enabling applied research technologies. This Project also matures and demonstrates advanced technologies leading to potential emerging capabilities in areas of strategic importance to the Army in autonomy, robotics and AI/ML, protection of both platform and occupant, and other ground platform technologies in propulsion, survivability, powertrain, etc., by bringing competitively selected Universities with research and development teams into Technical Alliances.

Research in this Project supports the Army Modernization Priority Next Generation Combat Vehicle.

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

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is done in coordination with Program Element (PE) 0620144A (Ground Technology), PE 0602145A (Next Generation Combat Vehicle Technology) and PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Robust autonomous capabilities for ground vehicles	-	2.136	1.959
Description: This effort demonstrates AI/ML and autonomous mobility integrated into ground vehicles to conduct off-road maneuvers to enable the transition from teleoperation to fully-autonomous or semi-autonomous scenarios. Research is conducted in collaboration with university partners to advance autonomous mobility and protection of both occupant and platform in optionally manned and autonomous ground vehicles.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) CJ9 / <i>Ground Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will further mature, integrate and demonstrate use of AI/ML methods to enable robust, autonomous, tactical behaviors for multi-agent air and ground vehicle teams beyond existing behaviors such as leader-follower (e.g., flanking, occupying); as well as increase the speed of autonomous behavior acquisition through effective navigation and route planning using techniques to identify terrain features in images and transfer of simulator-learned behaviors to developmental ground platforms. Mature and demonstrate methods of shared control (between human operators and AI/ML systems) that increase overall autonomous system performance with human input.</p> <p>FY 2023 Plans: Will further mature, integrate and demonstrate use of AI/ML methods that enable robust, autonomous, tactical behaviors for multi-agent air and ground vehicle teams beyond existing behaviors on common software platforms and Army experimental platforms. Will continue to mature and demonstrate emerging autonomous technologies to increase the overall system performance of the autonomy software platforms through academia.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects realignments to PE 0603116A (Lethality Advanced Technology) / Project CG2 (Lethality Enabling University Adv Development) and PE 0603042A (C3I Advanced Technology) / Project CN3 (Network Enabling University Adv Development).</p>				
<p>Title: Human-robot/AI interactions</p> <p>Description: This effort matures, integrates, and demonstrates systems involving physical and cognitive levels of interactions between humans and robots, with the use of reinforcement machine learning which uses human feedback, learning from demonstrations, and safe human-aware controllers. Work is conducted in collaboration with university partners to advance autonomous mobility as well as other areas of ground platform technologies in propulsion, survivability, powertrain, sensing, and perception.</p> <p>FY 2022 Plans: Will further mature, integrate and demonstrate use of AI/ML methods to improve autonomous systems by capturing and learning from human teleoperation commands, human interventions, and other forms of human interaction (e.g., spoken language). Will mature and demonstrate tactics and algorithms on common software platforms which enable robots to deal with complex environments on the fly while working fully autonomously around humans for extended periods of time.</p> <p>FY 2023 Plans: Will further mature, integrate and demonstrate use of AI/ML methods to improve autonomous systems by capturing and learning from human teleoperation commands, human interventions, and other forms of human interaction. Will mature and demonstrate</p>		-	1.727	1.937

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) CJ9 / <i>Ground Enabling University Adv Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
tactics and algorithms on common software platforms and Army experimental platforms through academia while working fully autonomously around humans for extended periods of time.				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.				
Title: SBIR/STTR Transfer		-	0.146	-
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		-	4.009	3.896
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>				Project (Number/Name) CV5 / <i>Engineer Enablers Maneuver, LOG, & Sustainment Adv</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CV5: <i>Engineer Enablers Maneuver, LOG, & Sustainment Adv</i>	-	-	-	2.539	-	2.539	3.298	4.781	2.183	3.586	0.000	16.387
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates joint contested logistics operations technologies and provides capabilities to operate in disbursed battlefield operations and support sustainment operations through predicted dynamic scenario development that provides critical vulnerabilities assessment and methods/equipment to mitigate potential issues.

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

Research is performed at the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

This research complements Program Element (PE) 0602144A (Ground Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Sustainment Planning Tool	-	-	2.539
Description: This effort will mature and demonstrate map-based sustainment running estimates with preposition of survivable material stockpiles based on synchronized ops/intel/log running estimates and informed by artificial intelligence (AI) based edge computing analyses.			
FY 2023 Plans: Will mature and optimize the existing Joint Planning Services (JPS)-developed Sustainment Quick Estimate model to connect to appropriate authoritative data sources and provide more robust capabilities for Sustainment Running Estimates (SRE).			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) CV5 / <i>Engineer Enablers Maneuver, LOG, & Sustainment Adv</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
This is a New Start for FY23.			
Accomplishments/Planned Programs Subtotals	-	-	2.539

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) DA2 / <i>SAFR Alternatives for Readiness Advanced Tech</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>DA2: SAFR Alternatives for Readiness Advanced Tech</i>	-	-	-	1.865	-	1.865	2.913	4.261	5.199	5.509	0.000	19.747
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project demonstrates cross-cutting, safer alternative advanced technologies that enable readiness. These technologies also support product availability, Soldier and worker safety, and a reduced environmental footprint in the manufacturing, maintenance, and use of ground vehicles and other Army weapon systems. The Project matures and optimizes safer alternatives in technology areas including surface finishes, coatings, solvents, refrigerants, and fire suppressants. This research addresses the growing impacts to health and readiness associated with carcinogens like hexavalent chromium, global warming chemicals like hydrofluorocarbons (HFCs) and persistent toxins like per- and polyfluoroalkyl substances (PFAS) (forever chemicals). This Project enables the Army to assess and resolve these types of emerging and continually evolving risks throughout the full life cycle of Army systems.

The cited research is consistent with the Army Modernization Strategy and provides enabling technologies in support of all Cross Functional Teams.

Research in this Project is performed by the United States (U.S.) Army Combat Capabilities Development Command (DEVCOM) Army Research Laboratory, Aberdeen Proving Ground, MD; the Armaments Center, Picatinny Arsenal, NJ; the Aviation and Missile Center, Huntsville, AL; the Soldier Center, Natick, MA; and the Ground Vehicle Systems Center, Warren, MI; and is coordinated with the United States (U.S.) Army Futures Command.

This Project complements and transitions technologies developed under Program Element (PE) 0602144A (Ground Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Safer Alternatives for Readiness (SAFR) Advanced Technology	-	-	1.865
Description: Demonstrate safer alternative advanced technologies to replace hexavalent chromium, cadmium and other harmful chemicals during surface finishing; reduce the use of volatile organic compounds and other hazardous materials in coating and depainting processes; and ensure the availability of compatible next generation refrigerants and fire suppressants with low global warming potential.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603119A / <i>Ground Advanced Technology</i>	Project (Number/Name) DA2 / <i>SAFR Alternatives for Readiness Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will demonstrate advanced non-chromium surface finishing techniques for use on ground systems; will mature non-chemical depainting alternatives to n-methyl pyrrolidone; and will optimize the performance of HFC alternatives against military-unique requirements for refrigerants and fire suppressants. FY 2022 to FY 2023 Increase/Decrease Statement: This Project is a new start in FY23.				
Accomplishments/Planned Programs Subtotals		-	-	1.865
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603134A / <i>Counter Improvised-Threat Simulation</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	24.087	24.747	21.486	-	21.486	21.571	21.551	21.817	21.811	0.000	157.070
CD3: <i>Counter Improvised-Threat Simulation</i>	-	24.087	24.747	21.486	-	21.486	21.571	21.551	21.817	21.811	0.000	157.070

A. Mission Description and Budget Item Justification

This Program Element (PE) develops technology for detecting and defeating Improvised Explosive Devices (IEDs). The goal of this research is to increase the ability of deployed forces to positively identify IEDs with minimal false alarms and positively neutralize or mitigate the effects of IEDs with minimal collateral damage.

This PE is executed by the Army Futures Command (AFC) in coordination with the Under Secretary of Defense for Research and Engineering (USD/R&E) and the Defense Threat Reduction Agency (DTRA).

B. Program Change Summary (\$ in Millions)

	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023 Base</u>	<u>FY 2023 OCO</u>	<u>FY 2023 Total</u>
Previous President's Budget	24.087	24.747	0.000	-	0.000
Current President's Budget	24.087	24.747	21.486	-	21.486
Total Adjustments	0.000	0.000	21.486	-	21.486
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	21.486	-	21.486

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603134A / <i>Counter Improvised-Threat Simulation</i>				Project (Number/Name) CD3 / <i>Counter Improvised-Threat Simulation</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CD3: <i>Counter Improvised-Threat Simulation</i>	-	24.087	24.747	21.486	-	21.486	21.571	21.551	21.817	21.811	0.000	157.070
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops technology for detecting and defeating improvised explosive devices (IEDs). The goal of this research is to increase the ability of deployed forces to positively identify IEDs with minimal false alarms and increase the rate of advance of deployed forces as well as to identify vehicle and personnel borne IEDs at fixed sites. Additionally the objective is to positively neutralize or mitigate the effects of IEDs with minimal collateral damage.

This Project is executed by the Army Futures Command (AFC) in coordination with the Under Secretary of Defense for Research and Engineering (USD/R&E) and the Defense Threat Reduction Agency (DTRA).

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

	FY 2021	FY 2022	FY 2023
Title: Standoff Detection of IED Threats in All Environments	9.470	9.804	10.090
<p>Description: This effort develops technology to detect IED threats at standoff distances. Technologies include electro-optical, radar, light detection and ranging (LIDAR), atomic magnetometer and other technologies applicable to detecting IEDs and their components that can be integrated on dismounted Soldiers, ground, water-based and aerial systems or at fixed sites. This effort also develops technologies and network techniques to detect the electronic signature of radio-controlled IEDs. Technologies will be evaluated on their ability to detect IEDs and their components within infrastructure, on or under ground and water, and attached to vehicles or personnel. The goal for these technologies is to achieve high probabilities of detection while minimizing false alarms from naturally occurring and man-made entities.</p> <p>FY 2022 Plans: Will further mature electro-optical/infrared and radio frequency sensor technologies applicable to detecting IEDs and their components in simulated environments. Will validate detection of radio-controlled IEDs using advanced network techniques. Will integrate sensor technologies on Soldier-borne, ground, and aerial platforms or at fixed sites to determine detection performance. Will demonstrate and assess detection of IEDs or their components when buried, camouflaged or attached to vehicles or personnel in various conditions.</p> <p>FY 2023 Plans: Will optimize electro-optical/infrared (EO/IR), electromagnetic (EM), neutron-gamma and radio frequency sensor technologies applicable to detecting IEDs and their components in simulated field environments. Will integrate sensor technologies on Soldier-</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603134A / <i>Counter Improvised-Threat Simulation</i>	Project (Number/Name) CD3 / <i>Counter Improvised-Threat Simulation</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>borne, ground, and aerial platforms or at fixed sites to validate IED detection performance. Will demonstrate and assess detection of IEDs or their components when buried, camouflaged or attached to vehicles or personnel in various operational conditions.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding partially realigned to Program Element (PE) 0602134A (Counter Improvised-Threat Advanced Studies) / Project CD2 (Counter Improvised-Threat Advanced Studies) to enable longer-term applied research pipeline of novel methods for detecting and defeating IEDs for transition to this project for future advanced technologies and demonstrators.</p>				
<p>Title: IED Neutralization, Prevention and Mitigation</p> <p>Description: This effort develops technology critical to neutralizing and mitigating the effects of IEDs at standoff distances. Technologies include directed energy sources, energetic or kinetic effectors, encasement of the threat and Soldier, platform and base protection technologies. These technologies will be demonstrated to neutralize IEDs in place and protect soldiers and equipment from the effects of IEDs. This effort also explores advanced techniques to robotically manipulate IEDs. The goal for these technologies is to achieve high probabilities of avoiding the IED's effects by friendly forces.</p> <p>FY 2022 Plans: Will mature energetic, directed energy and kinetic effector technologies to neutralize IEDs or mitigate IED effects. Will optimize protection approaches to mitigate the effects of IEDs to Soldiers, materiel and bases. Will demonstrate novel C-IED mitigation capabilities in militarily relevant environments.</p> <p>FY 2023 Plans: Will validate energetic and directed energy technologies to neutralize IEDs or mitigate IED effects. Will continue to demonstrate novel C-IED mitigation capabilities in militarily relevant environments.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding partially realigned to PE 0602134A (Counter Improvised-Threat Advanced Studies) / Project CD2 (Counter Improvised-Threat Advanced Studies) to enable longer-term applied research pipeline of novel methods for detecting and defeating IEDs for transition to this project for future advanced technologies and demonstrators.</p>		5.319	4.833	3.108
<p>Title: Enabling C-IED Technologies</p> <p>Description: This effort develops technologies that support the detection, prevention, neutralization and mitigation of IED threats. Technologies include data sciences including sensor processing algorithms, integration of sensor data, data processing and analytics, threat forecasting, and autonomous maneuver. Techniques will be demonstrated to determine detection of IED threats and to identify trends to forecast probabilities of encountering or attributing IEDs based on operational data and machine learning techniques. The goals for these technologies is to achieve high probabilities of detecting, predicting and attributing IEDs threats.</p>		9.298	9.283	8.288

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603134A / <i>Counter Improvised-Threat Simulation</i>	Project (Number/Name) CD3 / <i>Counter Improvised-Threat Simulation</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Will integrate advanced sensor processing techniques with appropriate sensor modalities and evaluate their ability to detect IED threats with reduced false alarms. Will analyze data from multiple sources to determine the signature attributes of threats and to identify the means to exploit these signatures to detect IED threats. Will apply machine learning and emerging data analysis techniques and algorithms to autonomously detect threats with limited operator input. Will analyze techniques to employ multi-sensor data inputs and networked sensor feeds to improve performance capabilities when compared to single sensor solutions.</p> <p><i>FY 2023 Plans:</i> Will validate advanced sensor processing techniques and their ability to detect IED threats with reduced false alarms. Will exploit foreign partner sources and existing U.S. data repositories to optimize emerging IED threat data sets in varying environments and develop new signature attributes that span multiple sensor modalities. Will validate machine learning and emerging data analysis techniques to autonomously detect threats with limited operator input.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding partially realigned to PE 0602134A (Counter Improvised-Threat Advanced Studies) / Project CD2 (Counter Improvised-Threat Advanced Studies) to enable longer-term applied research pipeline of novel methods for detecting and defeating IEDs for transition to this project for future advanced technologies and demonstrators.</p>			
<p><i>Title:</i> FY2022 SBIR/STTR Transfer</p> <p><i>Description:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>	-	0.827	-
Accomplishments/Planned Programs Subtotals	24.087	24.747	21.486

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603386A / <i>Biotechnology for Materials - Advanced Research</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	-	53.736	56.853	-	56.853	38.881	36.634	25.045	25.039	0.000	236.188
CP7: <i>Biotechnology Demonstration and Evaluation</i>	-	-	53.736	56.853	-	56.853	38.881	36.634	25.045	25.039	0.000	236.188

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates novel biotechnological methods, processes, and materials to enhance military supply chain resilience. The Army is responsible for centrally managing funding for Tri-Service Biotechnology for a Resilient Supply Chain (T-BRSC) efforts. T-BRSC leverages bio-industrial manufacturing to ensure critical domestic supply chain resilience for defense needs through domestic production of raw materials and critical products. The Army supports this Tri-Service effort under this PE with collaboration among sister Services and select allied partners to support a robust pipeline for biotechnology related manufacturing. Advanced research projects optimize and rapidly demonstrate future novel biotechnologies for disruptive breakthrough capabilities. This PE provides bio-engineered and biosynthetic materials to ensure domestic sourcing of critical products in the defense supply chain. Also under this PE, efforts mature and demonstrate rapid prototyping methods for rapid testing of bio-derived materials as well as optimize models for the design and bio-security of bio-engineered materials for defense applications.

This PE is coordinated with PE 0602386A (Biotechnology for Materials - Applied Research).

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

Research in this PE is performed by the United States (US) Army Futures Command (AFC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	0.000	53.736	0.000	-	0.000
Current President's Budget	0.000	53.736	56.853	-	56.853
Total Adjustments	0.000	0.000	56.853	-	56.853
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	56.853	-	56.853

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603386A / <i>Biotechnology for Materials - Advanced Research</i>	
<u>Change Summary Explanation</u> Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603386A / <i>Biotechnology for Materials - Advanced Research</i>				Project (Number/Name) CP7 / <i>Biotechnology Demonstration and Evaluation</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CP7: Biotechnology Demonstration and Evaluation</i>	-	-	53.736	56.853	-	56.853	38.881	36.634	25.045	25.039	0.000	236.188
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project collaborates with Joint Service partners to mature, optimize, and demonstrate novel biotechnologies and related methods to establish a domestic resilient supply chain for defense needs. Advanced research validates and provides bio-derived, bio-functionalized, and bio-manufactured materials. This Project matures and demonstrates high-throughput screening and small-scale prototyping, enhances material performance, and exploits biotechnologies to provide drop-in replacements and materials with enhanced properties for defense applications. Areas of focus may include high density, high performance fuels for high speed weapons, bio-based propellants, optical materials, and bio-derived systems that sense and respond to the presence of contaminants.

This Project is coordinated with Program Element (PE) 0602386A (Biotechnology for Materials - Applied Research) / CP6 (Foundational Biotechnology Design and Dev).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Biosynthetic Material Demonstration	-	51.774	56.853
Description: This task matures and demonstrates novel and emerging biotechnologies related to bio-engineered or bio-manufactured materials to address vulnerabilities in the critical material supply chain for military needs.			
FY 2022 Plans:			
? Provide Tri-Service rapid prototyping capability for the rapid prototyping and evaluation of bio-products for defense applications to compress the timeline for bio-material development, prototyping, and qualification in support of accelerating transitions. These capabilities include high-throughput screening and small-scale prototyping, small scale material purification, and a Department of Defense (DoD) custom capacity for rapid screening and evaluation.			
? Exploit biomanufacturing to provide mission-critical materials and reduce cost and burden of logistics for supply and resupply. Mature bio-manufactured drop-in replacement of high performance fuel by optimizing and validating high density, high performance fuel blends for high speed weapons in support of hypersonic flight.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603386A / <i>Biotechnology for Materials - Advanced Research</i>	Project (Number/Name) CP7 / <i>Biotechnology Demonstration and Evaluation</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>? Exploit the agility and flexibility in bio-manufacturing capabilities to address gaps in material performance and demonstrate enhanced material and system performance for ensured operational dominance in contested environments. Mature fire-resistant coating for high-temperature, fire-resistant composite materials in support of long-range missile cases and hypersonic flight.</p> <p>FY 2023 Plans:</p> <p>? Optimize and expand the Tri-Service capability for rapid maturation, demonstration, and evaluation of bio-products for defense applications by exploiting the use of robotics for semi-autonomous capabilities. This Tri-Service capability will support the rapid assessment of biotechnology solutions and biotechnologically derived materials with cutting-edge instrumentation.</p> <p>? Optimize bio-manufacturing methods and demonstrate the production of materials for defense needs at reduced cost compared to commercial sources to provide an alternative means of sourcing critical materials. Demonstrate the methods for the large scale bio-manufacture of a drop-in replacement high performance fuel blend to support high speed weapons in hypersonic flight.</p> <p>? Optimize bio-manufacturing methods and capabilities for the production of a fire-resistant coating for high-temperature, fire-resistant composite materials supporting long-range missile cases and hypersonic flight. The result will be a bio-manufactured materials with improved performance that can be exploited as a viable resource for Warfighter dominance.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle of this effort.</p>				
<p>Title: SBIR/STTR Transfer</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	1.962	-
Accomplishments/Planned Programs Subtotals		-	53.736	56.853
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603457A / C3I Cyber Advanced Development
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	43.357	61.426	41.354	-	41.354	28.720	19.097	34.073	34.361	0.000	262.388
6CY: Autonomous Cyber Advanced Technology	-	5.995	9.304	11.188	-	11.188	7.495	4.603	19.081	22.594	0.000	80.260
8CY: Information Trust Advanced Technology	-	10.900	15.876	20.028	-	20.028	11.138	4.157	-	-	0.000	62.099
9CY: Network Access and Effects Advanced Technology	-	4.464	4.347	8.170	-	8.170	10.087	10.337	14.992	11.767	0.000	64.164
CB4: Offensive Cyber Operations (OCO) Mirror Adv Tech	-	1.998	1.899	1.968	-	1.968	-	-	-	-	0.000	5.865
CB6: C3I Cyber Advanced Development (CA)	-	20.000	30.000	-	-	-	-	-	-	-	0.000	50.000

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

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>
---	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	43.357	31.426	0.000	-	0.000
Current President's Budget	43.357	61.426	41.354	-	41.354
Total Adjustments	0.000	30.000	41.354	-	41.354
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	30.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	41.354	-	41.354

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: *Program Increase - Low SWAP Software-Defined MFEW*

Congressional Add Subtotals for Project: CB6

Congressional Add Totals for all Projects

	FY 2021	FY 2022
	10.000	30.000
	10.000	-
	20.000	30.000
	20.000	30.000

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
6CY: Autonomous Cyber Advanced Technology	-	5.995	9.304	11.188	-	11.188	7.495	4.603	19.081	22.594	0.000	80.260
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will demonstrate 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.

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

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Autonomous Cyber	5.995	9.304	11.188
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 2022 Plans: Will validate the interoperable AI/ML based cyber defense decision aid architecture supporting warfighter planning in a high-fidelity cyber emulation environment; will demonstrate significant performance improvements in cyber response course of action decision aid software while optimizing the ingestion and correlation of event feeds from existing sensors, cybersecurity applications, and services to provide intuitive recommendations to the S6 Cyber Electromagnetic Activities (CEMA) personnel for use in countering adversarial cybersecurity events in a high-fidelity cyber emulation environment. This technology will ease the burden of knowledge, validate correctness of actions, and speed response decisions.			
FY 2023 Plans: Will mature and demonstrate AI/ML based cyber defense decision aid architecture supporting warfighter planning at a soldier run exercise; will mature and demonstrate sensors that can adapt to and autonomously react to adversary cyber-attack at a soldier run exercise; will 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			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022		
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 2021	FY 2022	FY 2023
vulnerable decisions, as well as demonstrate these capabilities in lab and field based demonstrations; will 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 2022 to FY 2023 Increase/Decrease Statement: Planned funding increase of this effort to improve and demonstrate cyber response course of action decision aid software.					
Accomplishments/Planned Programs Subtotals			5.995	9.304	11.188
C. Other Program Funding Summary (\$ in Millions) N/A					
Remarks					
D. Acquisition Strategy N/A					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
8CY: Information Trust Advanced Technology	-	10.900	15.876	20.028	-	20.028	11.138	4.157	-	-	0.000	62.099
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.

Research in this Project complements Program Element (PE) 06022213A (C3I Applied Cyber) / Project 2CY (Information Trust Technology) and PE 0602213A (C3I Applied Cyber) / Project CY1 (Information Assurance and Network Resiliency Tech).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Information Trust Advanced Technology	3.500	4.507	6.532
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 2022 Plans: Will mature and demonstrate the specification based fixed format message checking and machine learning based integrity services that ensure the integrity of a messages data, origin, and chain of custody as it traverses the network; will mature and demonstrate the authentication service proof-of-concept that helps determine and track user trust values within a block chain architecture; will implement and mature technology to create a suitable de-centralized lightweight block chain algorithm that can be leveraged to ensure a secure distributed ledger of messages and associated risk with automated analysis of attempted malicious modification; will optimize user and role-based authentication services and demonstrate within high fidelity cyber emulation environment.			
FY 2023 Plans: Will 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; will optimize specification based and machine learning based integrity services and will demonstrate within high fidelity cyber emulation			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
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 2021	FY 2022	FY 2023
<p>environment; will 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; will optimize the lightweight blockchain technology within a high fidelity cyber emulation environment; will 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.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding in this effort was increased for 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 2022 Plans: Will integrate a demonstrable baseline Cross Domain Solution (CDS) which will incorporate MSL Access Guard with the MPE Transfer Guard solution. Will conduct a validation and verification evaluations and field tests, on the final Integrated CDS deliverable in order to prove out the technology. Will mature all supporting documentation generated throughout the length of the Agile Virtual Enclave (AVE) program to include Preliminary Design Reviews (PDRs) and Capabilities Design Document (CDDs) for all the deliverables. Will mature a generalized solution for use on MSL Access Guard platform with potential for adaptation across Armed Forces systems and will incorporate it into the final deliverable.</p> <p>FY 2023 Plans: Will 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; will mature Access and Transfer Guard components; will conduct lab and field-based risk reduction activities; will 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 2022 to FY 2023 Increase/Decrease Statement: Funding in this effort was increased to mature and demonstrate technology to develop a MLS Access Guard for data sharing in a mission partner environment with a reduced hardware footprint.</p>		7.400	11.369	13.496
Accomplishments/Planned Programs Subtotals		10.900	15.876	20.028

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
9CY: Network Access and Effects Advanced Technology	-	4.464	4.347	8.170	-	8.170	10.087	10.337	14.992	11.767	0.000	64.164
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.

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

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Offensive Cyber Enabling Mission Support	4.464	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 2022 Plans: Will mature and demonstrate OCO/RF enabled access and effects vectors against validated targets of interest; optimize assisted technique development for expedited vulnerability discovery against validated Adversary Command, Control, Communication, Computers, and Intelligence (AC4I) targets of interest; and mature decision aids for optimization of RF enabled techniques in support of the Commander's desired intent.			
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 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

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
--	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding increase to mature and demonstrate technologies for higher ranked priorities for Offensive Cyber capability development and deployment.			
Accomplishments/Planned Programs Subtotals	4.464	4.347	8.170

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
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				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CB4: <i>Offensive Cyber Operations (OCO) Mirror Adv Tech</i>	-	1.998	1.899	1.968	-	1.968	-	-	-	-	0.000	5.865
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.

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

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Offensive Cyber Operations Mirror	1.998	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 2022 Plans: Will mature and demonstrate incremental modeling and simulation (M&S) software and optimize fidelity driven Development Security Operations (DevSecOps) with exemplar OCO/Radio Frequency (RF) firing platforms; demonstrate information operations social influence mission functions within relevant environment; and optimizes the ?body of evidence? necessary to achieve an accredited rapid response enclave in support of DevSecOps utilization of tactical OCO/RF Enabled platforms at mission speed.			
FY 2023 Plans: Will demonstrate OCO Mirror Rev 3 product at annual Cyber Blitz test event. Will 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 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding change reflects planned life cycle of effort			
Accomplishments/Planned Programs Subtotals	1.998	1.899	1.968

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

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)
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CB6: C3I Cyber Advanced Development (CA)	-	20.000	30.000	-	-	-	-	-	-	-	0.000	50.000
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 2021	FY 2022
Congressional Add: Program Increase - High Bandwidth Cryptomodule Enhancements and Certification	10.000	30.000
FY 2021 Accomplishments: Conducted advanced research in High Bandwidth Cryptomodule Enhancements and Certification. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for High Bandwidth Cryptomodule Enhancements and Certification		
Congressional Add: Program Increase - Low SWAP Software-Defined MFEW	10.000	-
FY 2021 Accomplishments: Conducted advanced research in Low SWAP Software-Defined MFEW. Work executed by Army Futures Command.		
Congressional Adds Subtotals	20.000	30.000

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

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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)

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	221.161	229.123	251.964	-	251.964	254.647	258.284	259.412	260.402	0.000	1,734.993
<i>DS7: High Performance Computing Modernization Program</i>	-	181.161	189.123	251.964	-	251.964	254.647	258.284	259.412	260.402	0.000	1,654.993
<i>DW5: HIGH PERF COMP MODERN (HPCM) (CA)</i>	-	40.000	40.000	-	-	-	-	-	-	-	0.000	80.000

A. Mission Description and Budget Item Justification

The High Performance Computing Modernization Program (HPCMP) addresses the supercomputing requirements of Department of Defense (DoD) scientists and engineers by: (1) demonstrating and maturing the most advanced, leading-edge computational architectures while exploiting the resulting systems by employing complementary specialized expertise; (2) demonstrating and maturing the Defense Research and Engineering Network (DREN), which investigates, demonstrates, and matures leading-edge digital networking and security technologies to securely deliver computational capabilities to the distributed DoD Research, Development, Test, and Evaluation (RDTE) community; and (3) leveraging specialized expertise from DoD, other federal departments and agencies, industry, and academia to demonstrate and mature leading-edge software application codes. DoD Supercomputing Resource Centers (DSRCs) provide extensive computational capabilities to demonstrate and mature emerging technologies that address the supercomputing requirements of the DoD RDTE community in the areas of hardware, software, and programming environments. All HPCMP sites are interconnected to each other, the DoD High Performance Computing (HPC) RDTE community, and other major defense sites via the DREN, a research network which investigates, demonstrates, and matures (a) state-of-the-art digital networking technologies to ensure a robust distributed environment and (b) the most advanced digital security capabilities to protect the intellectual property of the DoD and its contract entities as they employ HPCMP capabilities. The HPCMP's software application effort (a) optimizes, enhances, demonstrates, and matures critical DoD physics-based and engineering software to allow scientists and engineers to execute calculations with precision and efficiency on leading-edge supercomputers, (b) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (c) demonstrates and matures leading-edge computational technology from academia and industry. These synergistic activities collectively demonstrate and mature horizontal technologies that are exploited across the DoD RDTE community, ensuring the DoD maintains the most advanced research and development ecosystem in computationally-intensive modeling and design.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>
---	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	221.161	189.123	0.000	-	0.000
Current President's Budget	221.161	229.123	251.964	-	251.964
Total Adjustments	0.000	40.000	251.964	-	251.964
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	40.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	251.964	-	251.964

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

Project: DW5: *HIGH PERF COMP MODERN (HPCM) (CA)*

Congressional Add: *Program increase*

	FY 2021	FY 2022
	40.000	40.000
Congressional Add Subtotals for Project: DW5	40.000	40.000
Congressional Add Totals for all Projects	40.000	40.000

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603461A / High Performance Computing Modernization Program				Project (Number/Name) DS7 / High Performance Computing Modernization Program			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DS7: High Performance Computing Modernization Program	-	181.161	189.123	251.964	-	251.964	254.647	258.284	259.412	260.402	0.000	1,654.993
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The High Performance Computing Modernization Program (HPCMP) addresses the supercomputing requirements of Department of Defense (DoD) scientists and engineers by (1) demonstrating and maturing the most advanced, leading-edge computational architectures and exploiting the resulting systems by employing complementary specialized expertise; (2) demonstrating and maturing the Defense Research and Engineering Network (DREN) which investigates, demonstrates, and matures leading-edge digital networking and security technologies to securely deliver computational capabilities to the distributed DoD Research, Development, Test, and Evaluation (RDTE) and acquisition engineering communities; and (3) leveraging specialized expertise from DoD, other federal departments/agencies, industry, and academia to demonstrate and mature leading-edge software application codes. DoD Supercomputing Resource Centers (DSRCs) provide extensive computational capabilities and demonstrate and mature emerging technologies that address the supercomputing requirements of the DoD RDTE and acquisition engineering communities in the areas of hardware, software, and programming environments. HPCMP sites are interconnected to each other, the DoD High Performance Computing (HPC) RDTE community, and other major defense sites via DREN, a research network which investigates, demonstrates, and matures (a) state-of-the-art digital networking technologies to ensure a robust distributed environment and (b) the most advanced digital security capabilities to effectively protect the intellectual property of the DoD and its contract entities as they employ HPCMP advanced capabilities. The HPCMP's software application effort (a) optimizes, enhances, demonstrates, and matures critical DoD physics-based and engineering software to allow scientists and engineers to execute calculations with precision and efficiency on leading-edge supercomputers, (b) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (c) demonstrates and matures leading-edge computational technology from academia and industry. These synergistic activities collectively demonstrate and mature horizontal technologies that are exploited throughout the DoD RDTE and acquisition engineering communities, ensuring the DoD maintains the most advanced research ecosystem in the areas of computationally-intensive modeling and design.

The research cited 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 2021	FY 2022	FY 2023
Title: Department of Defense Supercomputing Resource Centers	95.975	96.537	144.207
Description: The effort investigates, demonstrates, and matures general and special-purpose supercomputing environments that incorporate the most advanced, leading-edge computational architectures, distributed mass storage technologies, and data analysis methodologies; employs complementary specialized expertise to mature and exploit these environments; enables the DoD RDTE and acquisition engineering communities to effectively and efficiently investigate, demonstrate, and mature a broad range of technologies through advanced computational methods.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans: Complete integration of commercial cloud computing, making it broadly available to the entire HPCMP user community. Integrate data-centric center methodologies into our supercomputing centers. Continue to accelerate technology capabilities with a suite of supercomputers and high-end computing services to address DoD priorities that satisfy the diverse needs of DoD stakeholders including security, workload, and architecture requirements. Continue to demonstrate the potential benefits of multiple architectures (scientific, analytics, machine learning, etc.) that incorporate leading-edge processors, accelerators, memory, data input/output (I/O), interconnect, and operating system (OS) capabilities. Continue to demonstrate new mechanisms to access and reduce barriers to supercomputers. Continue to leverage data-intensive supercomputing architectures for DoD use cases in machine learning, artificial intelligence, and data sciences. Implement new capabilities for secure shared highly-classified supercomputing, transportable data-intensive computing at the tactical edge, and persistent data services.</p> <p>FY 2023 Plans: Will accelerate the integration of commercial cloud computing, with the goal of making it broadly available to the entire HPCMP user community. Will continue to integrate data-centric center methodologies into our supercomputing centers to improve the ability to rapidly extract information from complex computations. Will continue to accelerate technology capabilities with a suite of supercomputers and high-end computing services to address DoD priorities that satisfy the diverse needs of DoD stakeholders including security, workload, and architecture requirements. Will continue to demonstrate the potential benefits of emerging High End Computing technologies including multiple architectures (scientific, analytics, machine learning, etc.) that incorporate leading-edge processors, accelerators, memory, data I/O, interconnect, and OS capabilities. Will continue to demonstrate new mechanisms to access and reduce barriers to supercomputers for non-traditional users and establish mechanisms for establishing hybrid cloud connectivity for HEC workflows. Will continue to leverage data-intensive supercomputing architectures for DoD use cases in machine learning, artificial intelligence, and data sciences. Will implement new capabilities for secure shared highly-classified supercomputing, transportable data-intensive computing at the tactical edge, and persistent data services. Will add additional capacity and capability in HPC through strategic retention of HPC assets and conduct pilot projects for burst to commercial cloud computing.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase ensures continued operations at DSRCs to include improved HPC simulation to close gaps in hypersonic development.</p>				
<p>Title: Defense Research and Engineering Network</p> <p>Description: The DREN effort investigates, demonstrates, and matures state-of-the-art digital networking technologies to ensure a robust distributed environment among HPCMP sites, the DoD HPC RDTE and acquisition engineering communities, and other major defense sites; investigates, demonstrates, and matures the most advanced digital security capabilities to effectively</p>		31.770	31.955	54.675

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>protect the intellectual property of the DoD and its contract entities as they employ HPCMP advanced capabilities; employs complementary specialized expertise to mature and exploit this environment.</p> <p>FY 2022 Plans: Continue to refine and exploit DREN (an advanced digital DoD wide area research network and part of the DoD Information Network backbone) which provides robust, high-bandwidth, low-latency, low-jitter, and full-service network connectivity among the HPCMP and DoD RDTE/AE communities with specific efforts targeted at the unique requirements of the test and evaluation (T&E) and AE communities. Complete source selection activities for DREN 4, initiated in Fiscal Year 2021 (FY21), leading to a contract award for commercial wide area network services. DREN 4 is the follow-on contract to DREN III, and will provide next-generation technical capabilities and significantly increased bandwidths to support the HPCMP and DoD RDTE/AE communities. Continue to enhance and refine the protection of all external DREN boundaries to enhance the HPCMP's DISA-accredited Tier 2 cybersecurity service provider capability to effectively protect the intellectual property of the DoD and its contract entities as they utilize HPCMP advanced capabilities. Establish and enhance network transport to the commercial cloud for those HPCMP and DoD RDTE/AE communities moving computation, data storage, and other requirements to the cloud environment. Continue to mature the advanced network technologies and complex cybersecurity mechanisms required to implement logically-separated networked COIs (communities of interest) at multiple classification levels.</p> <p>FY 2023 Plans: Will continue to refine and exploit DREN (an advanced digital DoD wide area research network and part of the DoDIN backbone) which provides robust, high-bandwidth, low-latency, low-jitter, and full-service network connectivity among the HPCMP and DoD RDTE/Acquisition Engineering (AE) communities with specific efforts targeted at the unique requirements of the T&E and AE communities. Will complete transisiton activities for DREN 4. DREN 4 is the follow-on contract to DREN III, and will provide next-generation technical capabilities and significantly increased bandwidths to support the HPCMP and DoD RDTE/AE communities. Will continue to enhance and refine the protection of all external DREN boundaries to enhance the HPCMP's DISA-accredited Tier 2 cybersecurity service provider capability to effectively protect the intellectual property of the DoD and its contract entities as they utilize HPCMP advanced capabilities. Will continue to establish and enhance network transport to the commercial cloud for those HPCMP and DoD RDTE/AE communities moving computation, data storage, and other requirements to the cloud environment. Will continue to mature the advanced network technologies and complex cybersecurity mechanisms required to implement logically-separated networked COIs at multiple classification levels. Removal of DREN under-provisioning.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects adjustments to align with projected allocations supporting the DREN to support enhancements within the network to include evolving cybersecurity requirements.</p>				
Title: Software Applications		53.416	53.728	53.082

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>
--	---	---

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

Description: This effort optimizes, enhances, demonstrates, and matures software applications to provide for the adaptation of widely used applications and algorithms to address RDTE and acquisition engineering communities requirements. The Computational Research Engineering Acquisition Tools and Environments (CREATE) initiative demonstrates and matures advanced application codes to allow scientists and engineers to use supercomputers to design and analyze virtual prototypes of DoD ships, fixed-wing aircraft, rotorcraft, ground vehicles, and radio frequency (RF) antennas; HPCMP Institutes demonstrate and mature advanced supercomputing application codes to address critical high-impact DoD challenges (e.g. blast protection for platforms and personnel, high-power microwaves and lasers, munition sensitivities, and mobile network designs/prototypes); High Performance Computing Applications Software Initiative (HASI) projects address the need to mature and refine critical DoD software that can take advantage of new and emerging hardware advances; the Frontier initiative represents and supports the DoD's highest-priority, highest-impact, most demanding computational work, both from a technical and mission-relevance standpoint; the Productivity, Enhancement, Technology Transfer, and Training (PETTT) initiative (1) optimizes and enhances critical DoD physics based and engineering software to allow scientists and engineers to execute scientific calculations with precision and efficiency on leading-edge supercomputers, (2) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (3) demonstrates and matures leading-edge computational technology from academia and industry.

FY 2022 Plans:

Continue to mature and enhance multi-disciplinary software technology in support of current and future defense programs, establishing a foundation for powerful decision support applications synthesized using machine learning methodologies. Multi-disciplinary technology for aeronautical systems of all types (i.e., fixed and rotary-wing aircraft, munitions, missiles, rockets, etc.), this endeavor matures model-centric conceptual design software technology to support Pre-Milestone-A Defense acquisition processes, enabling application of physics-based analysis of alternatives, technology trade-space exploration, and analysis of cost implications. Continue to mature software improvements necessary to deploy production quality physics-based design analysis tools for future hypersonic weapon systems (High Speed Strike, Tactical Boost-Glide, and Manned/Unmanned Conventional Prompt Global Strike). For fixed-wing aircraft, a) continue incorporating new generation of high order accuracy solvers; b) continue implementing hypersonic terminal maneuvers; and c) continue incorporating hypersonic long-duration/heat soak algorithms. For rotorcraft, continue aeromechanics analysis associated with maneuvers, airframe propulsion system integration, and weapons carriage and release, as well as infrared suppression analysis, chaff trajectory prediction, debris ingestion analysis, and loads prediction capability necessary for structural airworthiness assessments. RF antenna design and analysis continue to mature computational electromagnetics capabilities to assist in design and evaluation of next generation radar for aircraft, ships, and ground-based platforms; continue demonstrating capability for assessment of electromagnetic hazards on ordnance and optimizing computational methods for electronic warfare assessments and evaluation of multiple antenna systems on a single platform. Continue to include efforts in aircraft radar signature prediction capabilities that effectively include propulsion system

	FY 2021	FY 2022	FY 2023

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>

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

inlet and exhaust. Continue efforts to incorporate high-resolution (XBand frequencies) virtual test and analysis capabilities for fighter-scale aircraft. For Naval Ships (surface and submarine), continue incorporation of; a) hullform optimization; b) multi-hull seakeeping capabilities; and c) virtual ship powering algorithms. Continue to incorporate 6-degree of freedom (6-DOF) submarine maneuvering. Continue development of ship shock virtual test and analysis capabilities. For Ground Vehicles continue to expand autonomy capabilities associated with ground mobility test requirements. Execute fact finding investigations to more fully understand how physics-informed machine learning can impact DoD priorities and effectively support decision makers throughout weapon system development, deployment, and operation life-cycle.

FY 2023 Plans:

Will continue to mature and advance multi-disciplinary software technology in support of current and future defense programs, building a foundation for powerful decision support applications synthesized using advanced machine learning methodologies. Multi-disciplinary technology for aeronautical systems of all types (i.e., fixed and rotary-wing aircraft, munitions, missiles, rockets, etc.), this endeavor will continue to mature model-centric conceptual design software technology to support high-fidelity digital simulations of weapons and weapon support systems across the product lifecycle. This application of physics-based analysis of alternatives, technology trade-space exploration, and analysis of cost implications will improve application. Will continue mature software improvements necessary to deploy production quality physics-based design analysis tools for future hypersonic weapon systems (High Speed Strike, Tactical Boost-Glide, and Manned/Unmanned Conventional Prompt Global Strike). For fixed-wing aircraft, a) will continue incorporating new generation of high order accuracy solvers; b) will continue implementing hypersonic terminal maneuvers; and c) will continue incorporating hypersonic long-duration/heat soak algorithms. For rotorcraft, will continue aeromechanics analysis associated with maneuvers, airframe propulsion system integration, and weapons carriage and release, as well as infrared suppression analysis, chaff trajectory prediction, debris ingestion analysis, and loads prediction capability necessary for structural airworthiness assessments. RF antenna design and analysis will continue to mature computational electromagnetics capabilities to assist in design and evaluation of next generation radar for aircraft, ships, and ground-based platforms; will continue demonstrating capability for assessment of electromagnetic hazards on ordnance and optimizing computational methods for electronic warfare assessments and evaluation of multiple antenna systems on a single platform a specific area of focus will be the application of antenna evaluation software on naval platforms. Will continue to include efforts in aircraft radar signature prediction capabilities that effectively include propulsion system inlet and exhaust critical to design and evaluation of 6th generation fighter/attack aircraft. Will continue efforts to incorporate high-resolution (XBand frequencies) virtual test and analysis capabilities for fighter-scale aircraft. For Naval Ships (surface and submarine), will continue incorporation of; a) hullform optimization; b) multi-hull seakeeping capabilities; and c) virtual ship powering algorithms. Will continue to incorporate 6-DOF submarine maneuvering. Will continue development of ship shock virtual test and analysis capabilities incorporating the results of recent CVN-78 shock trials in preparation for establishing alternatives for future ship classes including FFG-62. For Ground Vehicles will continue to expand autonomy capabilities associated with ground mobility test requirements. Will execute fact finding investigations to understand how physics-informed machine learning more fully can impact DoD priorities and

FY 2021	FY 2022	FY 2023

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / High Performance Computing Modernization Program	Project (Number/Name) DS7 / High Performance Computing Modernization Program		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
effectively support decision makers throughout weapon system development, deployment, and operation life-cycle. Reintroduction of in-situ HEC subject matter experts to improve S&T efforts directly supporting technology transfer into programs of record and prototype efforts.				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease reflects adjustments to align with projected allocations supporting software applications. The level of effort within software applications have been reduced to facilitate the availability of funding to support enhanced DREN requirements.				
Title: FY 2022 SBIR/STTR Transfer		-	6.903	-
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		181.161	189.123	251.964
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / High Performance Computing Modernization Program	Project (Number/Name) DW5 / HIGH PERF COMP MODERN (HPCM) (CA)
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DW5: HIGH PERF COMP MODERN (HPCM) (CA)	-	40.000	40.000	-	-	-	-	-	-	-	0.000	80.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project enables the Defense Research, Development, Test and Evaluation (RDT&E) community to resolve critical scientific and engineering problems more quickly, and with more precision, using advanced, physics-based computer simulation supported by high performance computing (HPC) technology. The computational expertise and resources enable Department of Defense (DoD) personnel to analyze phenomena that are often impossible, not cost effective, too time-consuming, or too dangerous to study any other way. The High Performance Computing Modernization Program (HPCMP) supports the requirements of the DoD's scientists and engineers in three major areas of effort: supercomputing resource centers, the Defense Research and Engineering Network (DREN), and software applications. DoD Supercomputing Resource Centers (DSRCs) provide extensive capabilities and demonstrate new technologies that address user requirements for hardware, software, and programming environments. Efforts of the DSRCs are augmented by dedicated HPC project investments (DHPis) that address near real-time and real-time HPC requirements. All sites in the HPC Modernization Program are interconnected to one another, the user community, and major defense sites via the DREN, a research network which matures and demonstrates state-of-the-art computer network technologies. The Software Application effort optimizes and improves the performance of critical common DoD applications programs to run efficiently on advanced HPC systems, matures and demonstrates leading-edge computational technology from academic and commercial partners, and provides collaborative programming environments.

The work cited 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 2021	FY 2022
Congressional Add: Program increase	40.000	40.000
FY 2021 Accomplishments: Program Increase supports advanced research on High Performance Computing.		
FY 2022 Plans: Congressional Interest Item funding provided		
Congressional Adds Subtotals	40.000	40.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					PE 0603462A / Next Generation Combat Vehicle Advanced Technology							
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	309.860	299.712	193.242	-	193.242	212.497	201.523	205.254	206.775	0.000	1,628.863
BF2: Autonomous Ground Resupply (AGR) Adv Tech	-	18.374	-	-	-	-	-	-	-	-	0.000	18.374
BF4: Combat Vehicle Robotics Adv Tech	-	10.104	26.765	29.463	-	29.463	34.550	36.226	45.407	45.104	0.000	227.619
BF7: Crew Augmentation and Optimization Adv Tech	-	4.211	3.768	4.326	-	4.326	3.795	4.334	4.386	4.385	0.000	29.205
BG1: Sensors for Auto Oper and Survivability Adv Tech	-	14.054	10.666	12.464	-	12.464	12.670	12.664	12.652	12.648	0.000	87.818
BG3: Modeling and Simulation for MUMT Advanced Tech	-	3.241	5.188	5.975	-	5.975	6.248	7.175	7.529	7.363	0.000	42.719
BG4: Adv Mobility Experimental Prototype Adv Tech Demo	-	3.760	2.819	-	-	-	-	-	-	-	0.000	6.579
BG5: Extended Line of Sight (ELOS) Advanced Technology	-	1.396	-	-	-	-	-	-	-	-	0.000	1.396
BG7: Ground Systems Active Defense (GSAD) Advanced Tech	-	36.496	52.172	60.371	-	60.371	57.781	49.425	52.255	55.800	0.000	364.300
BG9: Obscuration Advanced Technology	-	10.533	2.511	2.765	-	2.765	2.813	2.810	2.811	2.810	0.000	27.053
BH1: Survivability Systems Controls Advanced Technology	-	11.880	-	-	-	-	-	-	-	-	0.000	11.880
BH4: Ground Vehicle Holistic Defense Adv Tech	-	-	0.034	-	-	-	-	-	1.427	1.798	0.000	3.259
BH6: Platform Electrification and Mobility Adv Tech	-	20.698	24.891	46.679	-	46.679	63.174	45.417	45.419	40.181	0.000	286.459
BH8: Enhanced VETRONICS Advanced Technology	-	11.809	14.989	10.776	-	10.776	10.223	10.559	9.317	12.641	0.000	80.314
BI3: Sensor Protection Advanced Technology	-	1.752	1.645	1.708	-	1.708	1.738	1.738	1.734	1.734	0.000	12.049

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>											
BI5: <i>Materials Application and Integration Adv Tech</i>	-	5.286	4.825	5.279	-	5.279	5.478	4.580	4.736	4.734	0.000	34.918
BJ1: <i>Vehicle System Security Advanced Technology</i>	-	1.444	2.455	-	-	-	-	-	-	-	0.000	3.899
BK1: <i>Autonomous Mobility Adv Tech</i>	-	11.370	6.087	6.323	-	6.323	5.282	5.286	-	-	0.000	34.348
BK4: <i>Next Gen Intelligent Fire Control(NG-IFC) Adv Tech</i>	-	23.205	1.727	2.198	-	2.198	2.309	2.985	-	-	0.000	32.424
BK6: <i>Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech</i>	-	0.224	-	1.534	-	1.534	2.053	9.850	12.613	12.622	0.000	38.896
BP6: <i>Ground Vehicle Advanced Technology(CA)</i>	-	116.200	135.250	-	-	-	-	-	-	-	0.000	251.450
BZ9: <i>Smart Targeting Environment for Lower Level Assets</i>	-	3.823	3.920	3.381	-	3.381	4.383	4.393	-	-	0.000	19.900
CU4: <i>Platform Agnostic Armaments Advanced Technology*</i>	-	-	-	-	-	-	-	4.081	4.968	4.955	0.000	14.004

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) executes development, maturation, and demonstration for the Army's modernization priority for the Next Generation of Combat Vehicle (NCCV). This PE matures, integrates and demonstrates combat vehicle technologies that enable the Army to have a smarter, faster, more lethal, more precise, more protected, and more adaptable force. Technology development builds upon the foundational vehicle architectures to support the NGCV, to include autonomy architecture, power architecture, vehicle electronic architecture, physical architecture, lethality architecture and vehicle protection architecture. Technologies developed, matured, and demonstrated will enable leap ahead capabilities for manned, optionally manned and unmanned vehicles that deliver decisive lethality.

Research in this PE complements PE 0602141A (Lethality Technology), PE 0602144A (Ground Technology), PE 0602145A (Next Generation Combat Vehicle Technology), PE 0602146A (Network C3I Technology), PE 0603116A (Lethality Advanced Technology), PE 0603119A (Ground Advanced Technology), PE 0603463A (Network C3I Advanced Technology), PE 0604115A (Technology Maturation Initiatives), and PE 0708045A (End Item Industrial Preparedness Activities). Research in this PE also transitions to PE 0603645A (Armored Systems Modernization Adv Dev) and PE 0604017A (Robotics Development).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>
---	---

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

This PE is directly aligned to the NGCV Army Modernization Priority.

Research is performed by the United States (U.S.) Army Futures Command and the U.S. Army Engineer Research and Development Center.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	302.209	164.951	0.000	-	0.000
Current President's Budget	309.860	299.712	193.242	-	193.242
Total Adjustments	7.651	134.761	193.242	-	193.242
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	135.250			
• Congressional Directed Transfers	-	-			
• Reprogrammings	7.651	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	193.242	-	193.242
• FFRDC Transfer	-	-0.489	-	-	-

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

Project: BP6: *Ground Vehicle Advanced Technology(CA)*

- Congressional Add: *Additive Manufacturing for Jointless Hull*
- Congressional Add: *Carbon Fiber and Graphite Foam Technology*
- Congressional Add: *Hydrogen Fuel Cells*
- Congressional Add: *ATE5.2 Engine Development*
- Congressional Add: *Additive Manufacturing of Critical Components*
- Congressional Add: *Combat Vehicle Weight Reduction Initiative*
- Congressional Add: *Virtual and Physical Prototyping*
- Congressional Add: *HMMWV Autonomy*
- Congressional Add: *HMMWV Automotive Enhancements*
- Congressional Add: *Program Increase - Combat Vehicle Blast Testing*

	FY 2021	FY 2022
	10.000	15.000
	10.000	5.000
	10.000	-
	10.000	5.000
	5.000	-
	10.000	5.000
	10.000	8.000
	3.000	-
	5.000	3.000
	6.000	-

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology
--	--

Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add: Program Increase - Advanced Adhesives	5.000	5.000
Congressional Add: Program Increase - Combat Vehicle Lithium 6T Battery Development	5.000	5.000
Congressional Add: Program Increase - Vehicle Technology Readiness Levels	2.000	-
Congressional Add: Program Increase - 10X Technology Demonstration	8.000	-
Congressional Add: Program Increase - HMMWV Augmented Reality HUD	5.000	-
Congressional Add: Program Increase - Operator?In?The?Loop Virtual and Physical Prototyping	4.000	-
Congressional Add: Program Increase - Next Generation Electrified Transmission	8.200	-
Congressional Add: Advanced Materials Applications	-	12.000
Congressional Add: Augmented Reality for Denied Environments	-	7.000
Congressional Add: Autonomous Minefield Clearance	-	7.000
Congressional Add: Autonomous Vehicle Mobility	-	10.000
Congressional Add: Carbon Fiber Tires	-	5.000
Congressional Add: Force Protection Vehicle Kit	-	5.000
Congressional Add: Fuel Cell Technology	-	5.000
Congressional Add: Machine Learning for Advanced Lightweight Combat Vehicle Structures	-	6.000
Congressional Add: Maneuverable Lightweight Electric Weight Reducer	-	5.000
Congressional Add: Off-Road Maneuver	-	5.000
Congressional Add: Predictive Maintenance System	-	2.000
Congressional Add: RCV-L	-	5.000
Congressional Add: Short Fiber Thermoplastic Applications	-	4.000
Congressional Add: Unmanned Navigational Technology	-	2.500
Congressional Add: Virtual Autonomy Environment	-	3.750
Congressional Add Subtotals for Project: BP6	116.200	135.250
Congressional Add Totals for all Projects	116.200	135.250

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BF2 / Autonomous Ground Resupply (AGR) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BF2: Autonomous Ground Resupply (AGR) Adv Tech	-	18.374	-	-	-	-	-	-	-	-	0.000	18.374
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate an improved ground supply distribution system across multiple levels of strategic and tactical sustainment operations. The Project will equip existing military ground vehicles with scalable robotic technology through the integration of modular kits, common interfaces, and a common architecture to improve inter-node supply movement. Further, the system will modernize and optimize the operations within the supply nodes to improve accountability and throughput. The objective of this Project is to integrate new and emerging technologies into the Army's sustainment system to improve throughput, accountability, and safety and provide the Warfighter with the flexibility needed to meet future needs.

The research under this Project will transition to the Leader Follower Program of Record (PoR). The architecture and safety work under this Project also lays the groundwork for the Next Generation Combat Vehicle (NGCV) Army Modernization Priority .

This Project matures and demonstrates simulation tools that predict autonomous vehicle performance. This Project also matures and demonstrates a real-time simulator that provides the ability to design and assess ground vehicle autonomous behaviors in adverse environmental conditions, reducing the need for field testing. These simulation technologies can be integrated across Army vehicle platforms as required.

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

Research in this Project supports the Army Modernization Priority Next Generation Combat Vehicle.

Research in this Project is performed by the United States (US) Army Futures Command and the US Army Engineer Research and Development Center.

Research in this Project is also coordinated with PE 0602145A (Next Generation Combat Vehicle Technology), and transitions to PE 0604017A (Robotics Development).

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

	FY 2021	FY 2022	FY 2023
Title: Architecture and Standards	7.035	-	-
Description: This effort matures and validates the government-owned autonomous architecture for an inclusive military library of behaviors that are non-proprietary and modular format to allow for design and development of payloads across the enterprise. This architecture allows the development and implementation of the same government owned software across multiple			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BF2 / <i>Autonomous Ground Resupply (AGR) Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
robotic systems. This will enable interoperability and modularity within systems and will lay the foundation for an affordable and sustainable lifecycle management model.				
Title: Hardware and Hardware-in-the-loop/Software-in-the-loop (HIL/SIL) Description: The HIL/SIL is a test system that uses real-time, physics-based models of the vehicle (multi-body dynamics), sensor systems (optics/signal processing and positioning), platform mobility (vehicle-terrain interaction) and weather/environment to provide a "virtual proving ground" for the Autonomous Ground Resupply (AGR) system.		4.519	-	-
Title: Soldier Experimentation Description: In conjunction with the Army Training and Doctrine Command (TRADOC) and Army Test and Evaluation Command (ATEC), this effort will employ unmanned systems in an operational evaluation to test the system in real word applications and environments. After the lab testing is complete and a safety test performed by ATC, then the soldier will provide the final test to determine if AGR is useful and rugged enough to enable the soldiers to increase through put on actual missions.		6.338	-	-
Title: Simulation Tools for Autonomous Ground Resupply Description: This effort matures and demonstrates a real-time and high-fidelity, hardware and software-in-the-loop simulation environment for evaluation of autonomous systems, and algorithm design and development for the same; demonstrates novel analysis methods for modeling and simulation to provide enhanced demonstrations of autonomous ground vehicles to include adverse environmental conditions.		0.482	-	-
Accomplishments/Planned Programs Subtotals		18.374	-	-
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BF4 / <i>Combat Vehicle Robotics Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BF4: <i>Combat Vehicle Robotics Adv Tech</i>	-	10.104	26.765	29.463	-	29.463	34.550	36.226	45.407	45.104	0.000	227.619
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates innovative enabling technologies that enable scalable integration of multi-domain robotic and autonomous system capabilities teamed within Army formations supporting all combat warfighting functions (close combat, reconnaissance, targeting and acquisition, etc.). Project focus areas include Platform Electronic Control and Autonomy Safety Engineering.

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

Research in this Project supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

Research is performed by the United States (U.S.) Army Futures Command (AFC).

Research is also coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology), and transitions to PE 0604017A (Robotics Development).

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

	FY 2021	FY 2022	FY 2023
Title: Platform Electronic Control	5.845	11.411	8.822
Description: This effort optimizes the electronic, closed loop control of by-wire vehicle systems to provide stable, reliable, and predictable control in the presence of potential malicious or unintended commands for both wheeled and tracked unmanned vehicles.			
FY 2022 Plans: Will develop an optimized solution to an expanded closed loop control of drive by-wire (DBW) systems for robotic ground vehicles to improve safe platform control. Will develop a stable interface, to control autonomous ground vehicle systems, for autonomy kits and/or user interfaces (UI) while maintaining safety critical aspects of the platform. Will demonstrate these enhancements through Engineering Evaluation Testing (EET) to ensure the autonomous technology has been fully evaluated for system safety, thereby demonstrating technical maturity. Will mature and demonstrate Robotic and Autonomy Systems (RAS) safety standards for unmanned ground vehicle systems. Will validate Ground Vehicle Robotics Safety Board published guidelines to show they meet best practices for development of safety critical software for unmanned ground vehicle systems. Validation of Ground Vehicle			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BF4 / <i>Combat Vehicle Robotics Adv Tech</i>

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

	FY 2021	FY 2022	FY 2023
<p>Robotics Safety Board processes will result in a useable safety confirmation to enable testing and reduced developmental time for testing of autonomous ground combat systems.</p> <p>FY 2023 Plans: Will mature and continue optimization of an expanded closed loop DBW system for robotic ground systems. Focus will be on optimization of a platform side vehicle control architecture which will be aligned to a known safety standard to mature the current safety pedigree of ground robotic systems this will enable more stable interface controls enabling ease of autonomy integration. Will demonstrate these enhancements through EET to show technical maturity. Will continue to mature and validate RAS safety standards for unmanned ground vehicle systems based on EET activities. Will update Ground Vehicle Robotics Safety Board published guidelines to show they meet best practices for development of safety critical software for unmanned ground vehicle systems while incorporating lessons learned. Validation of Ground Vehicle Robotics Safety Board processes will result in improved safety pedigree which will enable higher confidence in receipt safety confirmation to enable testing and reduced developmental time for testing of autonomous ground combat systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased in Fiscal Year 2023 (FY23) reallocated to PE 0603462A / Project BH6 (Platform Electrification and Mobility Adv Tech).</p>			
<p>Title: Unmanned Maneuver</p> <p>Description: This effort matures and demonstrates the advanced mobility performance of autonomous systems within complex, combat scenarios to allow for the completion of mission goals in individual and teaming configurations at various levels of autonomy.</p> <p>FY 2022 Plans: Will improve and demonstrate autonomous vehicle maneuvering in rough terrain. Will demonstrate the ability to detect and avoid negative obstacles, such as large holes, bodies of water, and cliffs. Will mature and demonstrate the ability to detect the characteristics of the terrain the vehicle is driving over, and optimize the combat vehicle's driving behaviors in response. Will demonstrate these enhancements through EET to ensure the autonomous technology has been fully evaluated for system safety, thereby demonstrating technical maturity.</p> <p>FY 2023 Plans: Will optimize and demonstrate autonomous vehicle maneuvering in hostile environments using government owned autonomy software, Robotic Technology Kernel (RTK). Will mature and demonstrate the ability to conduct Manned-Unmanned Teaming maneuvers including human team members. Will improve cybersecurity posture in development of autonomy. Will demonstrate advanced collaborative surveillance behaviors for unmanned ground vehicles. Will demonstrate all enhancements though EET to ensure the autonomous technology has been fully evaluated for system safety, thereby demonstrating technical maturity. Will</p>	2.931	9.099	14.171

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BF4 / <i>Combat Vehicle Robotics Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>mature the Autonomous Ground Vehicle Reference Architecture (AGVRA) framework by developing conceptual, logical and physical data models while connecting them to exiting instantiated architectures and further develop safety and cyber models and associated libraries to support these evolving model viewpoints. Will develop and mature the Robot Operating System ? Military (ROS-M) to support the registration and distribution of Robotic and Autonomous System models.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increased in FY23 to optimize autonomous forward surveillance and small unmanned ground vehicles (UGVs) as deployable sensors including support of on-going soldier evaluations of unmanned systems.</p>				
<p>Title: Soldier-Robotic Interface Integration</p> <p>Description: This effort is a focused approach to optimize control of the unmanned systems with improved performance incorporating Manned-Unmanned Teaming enabled formations and is measured against multiple phases of the combat scenario for improved operational effectiveness and overall system performance.</p> <p>FY 2022 Plans: Will develop an expanded operator span of control for robotic vehicles in defined mission to improve Manned /Unmanned Teaming to increase operator standoff and enable control of multiple platforms. Will demonstrate these enhancements through EET to ensure the autonomous technology has been fully evaluated for system safety, demonstrating technical maturity.</p> <p>FY 2023 Plans: Will mature and demonstrate an enhanced human robot interaction technology to improve the effectiveness of the robot as a tool for the human to complete the mission utilizing built in government owned Warfighter Machine Interface (WMI) software. Will exploit Manned /Unmanned Teaming technologies that will allow the operator to be at a longer standoff distance while enabling efficient control of robotic platforms. Will optimize novel control methods leveraging a wide range of hardware interfaces to improve robotic control across multiple control methods (mounted interface / dismounted-tablets/heads-up displays). Will demonstrate these technology enhancements through EET to validate the autonomous technology system safety and technical maturity.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned to Small UGV as Deployable Sensor effort within this Project to better align with the research of artificial intelligence of multi-domain robotic and autonomous system capabilities.</p>		1.328	5.278	4.138
<p>Title: : Small UGV as Deployable Sensor</p> <p>Description: This effort improves the long range autonomy, mobility and sensing capabilities of small UGVs to expand reconnaissance in terrains and environments large systems cannot reach (i.e. culverts, underground, dense urban) and to serve</p>		-	-	2.332

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BF4 / <i>Combat Vehicle Robotics Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>as unmanned listening & observation posts. The small UGVs will deploy out of NGCV systems to enhance battlespace awareness and reduce the risk to the systems.</p> <p>FY 2023 Plans: Will develop and optimize small robot autonomy built within the government owned RTK autonomy software to overcome size, weight and power (SWaP) limitations of small platforms. Will develop and implement enhanced functionality and task-distribution (swarming) to overcome mobility and functional limitations of small robots for effective reconnaissance. Will mature and demonstrate MMPs interoperable across multiple platforms that provide commanders with options to configure systems to the mission needs. Will demonstrate these enhancements through Engineering EET to ensure the autonomous technology and integrated MMPs have been fully evaluated for system safety, performance and technical maturity.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from the Soldier-Robotic Interface integration effort in this Project to mature and demonstrate small robot autonomy technologies that will enhance functionality and overcome mobility limitations for more effective reconnaissance with reduced operator direct control.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.977	-
Accomplishments/Planned Programs Subtotals	10.104	26.765	29.463

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology			Project (Number/Name) BF7 / Crew Augmentation and Optimization Adv Tech				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BF7: Crew Augmentation and Optimization Adv Tech	-	4.211	3.768	4.326	-	4.326	3.795	4.334	4.386	4.385	0.000	29.205
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced technologies to enable crew augmentation and optimization for closed hatch operations of ground vehicle platforms in a complex multi-domain operations environment. This includes integration of intelligent technologies to improve dynamic tasking and full crew interactions, machine learning to improve decision aids, early warnings, reduce response times and shorten task durations, and machine learning to optimize tasking and function. Mature technologies are incorporated onto existing or prototype Army-owned technology demonstrators so that performance of the enabling technologies can be evaluated.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is conducted by the United States (US) Army Futures Command.

Work in this Project is also coordinated with work in Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology) and PE 0602143 (Soldier Lethality Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Crew Augmentation and Optimization Advanced Technology	4.211	3.630	4.326
Description: This effort focuses on optimizing crew station technologies while reducing crew sizes that will provide the same overall performance by exploiting human-machine interaction technologies, automation, machine intelligence and customization to permit soldiers to achieve performance beyond today's constrained ground vehicle environment			
FY 2022 Plans: Will mature and demonstrate vehicle and crew task management at the section level to enable sharing of critical tasks between crew and robotic operators during times of high workload. Will integrate and demonstrate interface advancements in novel display technologies (i.e. helmet mounted displays) to improve situational awareness. Will demonstrate section-level teaming of crew and robotic operator configuration to permit reconfiguration of mission roles. Will validate effectiveness in an operationally-relevant, field experiment.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BF7 / <i>Crew Augmentation and Optimization Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Will integrate and demonstrate a threshold capability to adapt autonomous technologies by providing information regarding battlefield context inferred from Soldier behaviors. Will integrate and demonstrate technology aids with basic integrated decision support tools for automated play calling and task allocation. Will integrate and demonstrate after-action review (AAR) technology that enables Soldier-driven adaption of autonomy behavior from mission to mission. Will validate effectiveness in an operationally-relevant and motion-based Modeling & Simulation (M&S) virtual validation. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort to focus on platoon-level validation over a section-level formation.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.138	-
Accomplishments/Planned Programs Subtotals	4.211	3.768	4.326

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BG1 / <i>Sensors for Auto Oper and Survivability Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG1: <i>Sensors for Auto Oper and Survivability Adv Tech</i>	-	14.054	10.666	12.464	-	12.464	12.670	12.664	12.652	12.648	0.000	87.818
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, optimizes, and demonstrates automated, advanced multi-function sensors and integrates threat cueing capabilities for operations in full spectrum, complex environments, for next generation manned, optionally manned, and robotic platform applications. This Project will deliver sensor payloads which provide greatly increased situational awareness (e.g. pre-shot and hostile fire detection, threat classification) in all environments for manned and unmanned ground vehicle systems.

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

Research in this Project supports the Army Science and Technology Next Generation Combat Vehicle, Soldier Lethality, and Future Vertical Lift modernization priorities.

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Sensors with Embedded Processing	8.680	5.539	8.787
<p>Description: Matures and demonstrates advanced, multi-spectral and multi-function sensors, and image processing capabilities with improved performance in all environments and against all threats to include low-contrast targets in camouflage or in degraded conditions. Matures and demonstrates rapid detection of concealed enemy optical threat systems (visible, midwave infrared, longwave infrared) and real-time hostile fire detection (HFD) for anti-armor threats while on the move, exploiting multi-functional imaging components and embedded processing. Enables enhanced situational awareness and targeting capabilities in complex environments via manned, optionally manned, and robotic platform applications.</p> <p>FY 2022 Plans: Will mature low-power processing approaches for high definition (HD) sensor data to exploit imagery in degraded environments and detect threats. Will validate performance of novel uncooled infrared sensors to assess the impact of increased dynamic range, sensitivity, and higher data rates for passive HFD of anti-armor threats. Will exploit infrared digital read out integrated circuit (DROIC) technologies for 3rd Gen Forward Looking Infrared to improve multi-spectral, multifunction targeting and threat detection for greatly enhanced range performance and increased ability to detect targets and threats in degraded environments. Will mature advanced pulsed mid-wave infrared laser technology to enable maturation of on-the-move threat optics detection capabilities.</p> <p>FY 2023 Plans:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG1 / <i>Sensors for Auto Oper and Survivability Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will optimize novel uncooled infrared sensors, incorporating low power processing to minimize system size, weight, and power. Will optimize targeting and threat detection sensors with embedded multifunction processing against threats at increased range in complex environments. Will mature and provide advanced targeting and navigation laser technologies, novel image processing approaches and infrared sensors for on-the-move target detection, ranging and tracking. Will validate image processing approaches to enable optimized transmission from sensor to shooter systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects investments required to develop advanced sensing capabilities with integrated targeting approaches for use in complex environments.</p>				
<p>Title: Multi-Mission Payload</p> <p>Description: Matures and demonstrates sensor payloads for ground vehicle based unmanned aerial systems to detect line of sight, and beyond line of sight threats and complex obstacles such as personnel and vehicles in all environments.</p> <p>FY 2022 Plans: Will improve performance of rotary and fixed wing unmanned aerial system (UAS) payloads to enable advanced detection of threats and targets in complex environments, day or night. Will exploit feature extraction and target detection techniques to enable advanced sensing capabilities inherent in the multi-modal sensor technologies to increase detection of near-peer threats and suppress clutter. Will demonstrate advanced sensor payloads in realistic open terrain environments to establish a baseline capability to augment maneuver and protection of small unit level formations.</p> <p>FY 2023 Plans: Will demonstrate rotary wing unmanned aerial system optionally tethered with a manned or unmanned ground vehicle (UGV) for detection of threats in complex environments, day or night. Will demonstrate real time feature extraction and target detection capabilities to increase detection of near-peer threats and suppress clutter. Will exploit fusion of polarization sensors and advanced lasers to enhance detection of a wider range of threats and improve target location accuracy.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decrease represents completion of preliminary sensor improvement development efforts necessary to enable demonstrations of a rotary wing unmanned aerial system optionally tethered with a manned or unmanned ground vehicles.</p>		5.374	4.736	3.677
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans:</p>		-	0.391	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG1 / <i>Sensors for Auto Oper and Survivability Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement:				
Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		14.054	10.666	12.464
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BG3 / <i>Modeling and Simulation for MUMT Advanced Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG3: <i>Modeling and Simulation for MUMT Advanced Tech</i>	-	3.241	5.188	5.975	-	5.975	6.248	7.175	7.529	7.363	0.000	42.719
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates modeling and simulation (M&S) tools/technologies to assess and improve freedom of movement for ground forces and supports vehicle developers by addressing challenges for robotic and ground vehicles. This Project matures and demonstrates obstacle detection capabilities for autonomous systems operating in complex environments. This Project also matures and demonstrates real-time mobility decision support tools, vehicle-terrain interaction models for autonomous convoy operations, simulation tools for vehicle mobility in highly altered terrain, and M&S tools for predicting the performance of autonomous vehicles. These M&S technologies can be integrated across Army vehicle platforms as required.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority .

Research in this Project is conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology) / Project BG2 (Modeling and Simulation for MUMT Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Simulation Tools for Combat Vehicle Robotics (CoVeR) Demonstrations	3.241	4.999	5.975
Description: This effort matures and demonstrates M&S tools to support the development of autonomous ground vehicle platforms and components for successful maneuver in unstructured and mission relevant environments. This effort demonstrates M&S capabilities to evaluate hardware and software technologies enabling battlefield autonomy in complex and challenging environments.			
FY 2022 Plans: Mature and demonstrate analytical tools and adaptive learning models for predicting autonomous maneuver performance and determining alternative routes in unstructured environments; and mature advanced algorithms to detect obstacles that affect maneuver corridors in unstructured environments.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG3 / <i>Modeling and Simulation for MUMT Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will mature and demonstrate advanced algorithms to detect obstacles to maneuver in unstructured and operationally relevant environments. Will mature and demonstrate computational environment test bed to support development of autonomous vehicle platforms and components; will release of M&S tools with high-fidelity software-in-the-loop capability. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.				
Title: FY 2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.189	-
Accomplishments/Planned Programs Subtotals		3.241	5.188	5.975
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks N/A				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology			Project (Number/Name) BG4 / Adv Mobility Experimental Prototype Adv Tech Demo				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG4: Adv Mobility Experimental Prototype Adv Tech Demo	-	3.760	2.819	-	-	-	-	-	-	-	0.000	6.579
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced powertrain, power generation and running gear technologies into a combat vehicle that will reduce the percentage of no-go terrain for ground vehicles, increase the maneuver speeds across all traversable terrain, reduce fuel demands thus extending operation time between resupply, and provide onboard power generation to enable the integration of energy-based capabilities such as directed energy weapons and electromagnetic armor.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is conducted by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0604115A (Technology Maturation Initiatives).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Mobility Experimental Prototype (AMEP) Advanced Technology	3.760	2.716	-
Description: This effort develops and demonstrates the advanced powertrain, track and running gear, and unmanned robotic technologies for integration into a ground combat vehicle that will provide increased mobility, maneuver speeds, and optionally manned capabilities in order to validate performance and capability enhancements at increased vehicle weights to inform ground combat vehicle design.			
FY 2022 Plans: Will improve running gear performance for ground combat vehicles with gross vehicle weights up to 50 tons.			
FY 2022 to FY 2023 Increase/Decrease Statement: Project completes in Fiscal Year 2022 (FY22).			
Title: FY2022 SBIR/STTR Transfer	-	0.103	-
Description: Funding transferred in accordance with Title 15 USC ?638			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG4 / <i>Adv Mobility Experimental Prototype Adv Tech Demo</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	3.760	2.819	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology	Project (Number/Name) BG5 / Extended Line of Sight (ELOS) Advanced Technology
--	--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG5: <i>Extended Line of Sight (ELOS) Advanced Technology</i>	-	1.396	-	-	-	-	-	-	-	-	0.000	1.396
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops a precision guided tank fire and forget 120-mm munition to engage high-value targets including heavy armor, the growing Anti-Tank Guided Munition (ATGM) threat (dismounted and mounted), and light armor at extended ranges (2 to 8 km (T), 2 to 12 km (O)).

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Extended Line Of Sight (ELOS) Advanced Technology	1.396	-	-
Description: This effort demonstrates a 120-mm Tank-fired ELOS Munition that counters the growing ATGM threat at extended line of sight ranges beyond current capability.			
Accomplishments/Planned Programs Subtotals	1.396	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG7: <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>	-	36.496	52.172	60.371	-	60.371	57.781	49.425	52.255	55.800	0.000	364.300
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates protection and survivability technologies to increase the survivability of ground vehicles and the protection of the Soldiers who depend on them. The tasks will focus on component maturation and demonstration and transfer products for demonstration as holistic (vehicle level) solutions. The Project will mature and demonstrate technologies to defeat threats throughout the timeline of a threat engagement; from obscuring a target, to actively defeat a threat and through mitigating its effects after engagement. These technologies include the active employment of smoke, physical and electronic active protection, advanced and adaptive armors, advanced and active blast mitigation systems and adaptive interior protection.

Research in this Project supports the Next Generation Combat Vehicle 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.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project will be coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology) and transitions to PE 0604852A (Suite of Vehicle Protection Systems - EMD).

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

	FY 2021	FY 2022	FY 2023
Title: Obscuration Technologies for Active Protection Systems	2.298	-	-
Description: Research, develop, test, evaluate, and demonstrate obscurant soft-kill vehicle protection technologies to defeat the observer/gunner, anti-tank guided missiles (ATGMs), and other guided threats. Design and evaluate systems that are Modular Active Protection System (MAPS) and Survivability Subsystem Controls (SSC) compliant.			
Title: Active Protection Technologies	6.898	-	-
Description: This effort demonstrates protection for light armored combat vehicles from anti-armor threat weapons such as rocket-propelled grenades (RPG), ATGM, and recoilless rifle projectiles (RR).			
Title: Advanced Radar and Soft-Kill (A-RASK) Suite	6.058	0.938	6.682

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort matures and demonstrates next generation vehicle radar technologies and holistic electronic warning and soft-kill countermeasure techniques to support a layered modular active protection suite and ensure the survivability of ground combat platforms in all-weather day or night conditions with 360 degree situational awareness and threat defeat.</p> <p>FY 2022 Plans: Will continue to develop soft-kill countermeasure techniques and effects for additional ATGM threats. Will conduct demonstrations of system capabilities with integrated techniques to assess system performance against multiple ATGM threat classes, launch profiles and distances.</p> <p>FY 2023 Plans: Will begin development of universal threat detection sensor hardware and algorithms to detect priority ATGM threats. Will evaluate sensor system level requirements based upon the latest live fire demonstration results from Fiscal Year 2022 (FY22). Will conduct sensor sub-system derived requirements analysis with modeling and simulation.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase reflects development of universal threat detection sensors in accordance with the project plan.</p>				
<p>Title: Long Range Hard Kill Countermeasure (LRHK-CM)</p> <p>Description: This effort matures and demonstrates a MAPS-compliant hard-kill countermeasure system able to defeat current threats such as RPG, ATGM and future threat munitions such as kinetic energy and artillery delivered sub-munitions. This effort will optimize a complete hard-kill active protection system including munitions, launcher, sensors, and fire-control, and demonstrate capabilities through modeling and simulation and live-fire demonstrations.</p>		1.396	-	-
<p>Title: Soft-Kill System Development</p> <p>Description: This effort focuses on maturing and demonstrating soft-kill system technologies to protect combat vehicles from current and emerging ATGM threats at stand-off distances with an unlimited magazine and low collateral hazard. This capability will also enhance situational awareness to vehicle occupants by detecting and alerting when threats have been fired. Technologies will be optimized and integrated on combat vehicles using the MAPS Framework and Controller. They will be demonstrated in a relevant environment.</p> <p>FY 2022 Plans: Will develop and mature soft-kill subsystems such as those developed in the Advanced Radar and Soft-Kill Suite effort in this Project by delivering soft-kill capabilities, environmentally hardening, upgrading to the latest revision of the MAPS Framework</p>		9.140	9.827	15.310

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>(MAF), and optimizing space, weight, and power (SWAP) of the subsystems. Will begin virtual / lab demonstrations to assess subsystem performance and robustness in preparation for system integration.</p> <p>FY 2023 Plans: Will develop components and other hardware needed for FY23 demonstration and vehicle integration in FY24. Will integrate the soft-kill subsystems matured in FY22 utilizing the MAPS Framework and Controller. Will optimize ground vehicle system performance and continue lab and field demonstrations to assess system performance of integrated subsystems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase reflects maturation of subsystems and focus on system-level integration for demonstration in accordance with the project plan.</p>				
<p>Title: Advanced Threat Protection</p> <p>Description: This effort matures and provides armor and occupant protection technology to protect against emerging both top and bottom attacks threats increasing vehicle survivability and Soldier protection.</p>		4.014	-	-
<p>Title: Survivability Capability Characterization and Demonstration</p> <p>Description: This effort evaluates and demonstrates emerging protection technologies to characterize and assess their performance and maturity and potential for transition to Product Manager (PdM) Vehicle Protection System (VPS).</p> <p>FY 2022 Plans: Canvas industry, academia, and government for unverified high potential / high impact survivability technologies that have applicability to current ground vehicle platform requirements. Down-select promising technologies and work with industry, academia, or government partners to begin planning for the demonstration and assessment of the technologies. Identify the technology and any other necessary resources for future demonstration.</p> <p>FY 2023 Plans: Will demonstrate and validate the selected survivability subsystem. Will transition relevant information to our acquisition stakeholders and help determine the feasibility of further maturing the subsystem. Will analyze available survivability subsystems capability and applicability to current ground vehicle platforms, targeting threats.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>		2.944	2.412	2.395
<p>Title: Sensors for Adaptive Armor</p>		2.714	1.629	1.502

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort matures and demonstrates sensor technology to enable an adaptive armor system using the MAPS Framework and Controller on a combat vehicle platform. This effort matures real-time processing software, continuously refines the threat trajectory prediction algorithm and integrates sensors with an adaptive countermeasure for threat defeat to the MAPS Framework and Controller to ensure the activation of adaptive armor to protect against incoming threats.</p> <p>FY 2022 Plans: Will optimize real-time processing software and improve trajectory prediction algorithm of the sensor technology to enable adaptive armor systems. Will mature sensor subsystem and will perform environmental and hardening testing.</p> <p>FY 2023 Plans: Will improve trajectory prediction algorithm of the sensor technology to enable adaptive armor system. Will mature sensor subsystem integration and demonstrate capabilities against pacing applicable threats in a relevant environment.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Active Blast Mitigation Environmental and Durability Validation</p> <p>Description: This effort demonstrates mature sensor technology for an Active Blast Mitigation System (ABMS) into the MAPS Framework on a combat vehicle platform with improved countermeasure design for protection from blast events. ABMS will support a reduction of injuries caused from underbody blast events by providing a counterforce to the blast acceleration of the vehicle hull.</p>		1.034	-	-
<p>Title: APS Residuals Protection Maturation and Complex Threat Attack Protection (CTAP)</p> <p>Description: This effort contributes to the Army's ground vehicle survivability by maturing, integrating, and demonstrating advanced technologies which physically defeat incoming threats. These technologies involve passive and reactive mechanisms that work seamlessly with active protection systems in order to increase the overall efficiency of the system. This effort will mature and demonstrate armor components that defeat residual blast and fragmentation from hard-kill active protection systems engagements with kinetic threats in order to protect vehicle occupants and critical subsystems. This effort also matures and demonstrates armor and occupant protection components that provide threat defeat for advanced and emerging threats with complex defeat mechanisms.</p> <p>FY 2022 Plans: Will mature and demonstrate component technologies developed under PE 0602145A (Next Generation Combat Vehicle Technology) / Project BG6 (Advanced Concepts for Active Defense Technology) for protection against degraded threats, ballistic shields for sensors, advanced mechanisms for moving armor to protect optics, and multi-functional modular seats to protect</p>		-	9.714	7.441

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>occupants from injury. Will mature and package these component designs for durability. Will demonstrate hardened component threat defeat performance through exposure to environmental conditions. Will validate that packaged component physical parameters, such as size and weight, are able to meet vehicle system-level design constraints.</p> <p>FY 2023 Plans: Will build upon prior year work to integrate and demonstrate packaged component for protection against threat residuals at the system-level. Will mature and optimize components through integrated system-level environmental and automotive durability testing, followed by ballistic testing, to validate performance against system-level requirements. Will validate compliance with vehicle system architecture. Will provide capstone demonstrations of capabilities to protect from pacing threats in a relevant environment.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding decreased as components for demonstrations have been developed in FY22 in accordance with the project plan.</p>				
<p>Title: Controls and Architecture</p> <p>Description: This effort provides the basis for holistic (vehicle level) active defense by ensuring compatibility of active defense subsystems and systems. This effort matures and demonstrates the effectiveness and efficiency of the controls and architecture for active defense systems. The focus will be to enable the integration of multiple emerging survivability technologies into safe and secure configurations. This effort will optimize size, weight, and power - cooling (SWaP-C) performance for the system components.</p> <p>FY 2022 Plans: Will build upon previous controls and architecture for APS efforts by advancing the intelligent decision management subsystem, cross domain management solution, active survivability safety measures, and vehicle user-interface subsystem for emerging survivability technologies. Will ensure that enhancements do not interfere with current compliant technology performance.</p> <p>FY 2023 Plans: Will optimize active survivability architecture for single platform protection. Will conduct build of base kit hardware and software products, to include enhancements, and will perform component level validation and verification. Will verify available components for coordinated efforts. Will validate software performance against new enhancements through regression testing to ensure backward compatibility. Will perform studies for collaborative active defense across multiple platforms.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>		-	5.253	5.617
<p>Title: Hard Kill Active Protection System (HK APS) Development, Integration, and Demonstration</p>		-	20.494	21.424

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>

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

	FY 2021	FY 2022	FY 2023
<p>Description: This effort matures, integrates, and demonstrates a HK APS capable of defeating RPGs, Anti-Tank Guided Missiles, and Recoilless Rifles ensuring the platform's ability to shoot, move and communicate after an engagement. The system will be compliant to the Modular APS Framework (MAF). This effort will optimize an HK APS that includes the following sub-systems; counter-measure, launcher, and sensors (active/passive). Will demonstrate HK APS capabilities in a virtual and live fire demonstration in a relevant operational environment.</p> <p>Counter-measure (CM): Matures and demonstrates CM designs that includes the following aspects: blast size, time of flight, velocity, engagement distance, accuracy, and SWaP-C. Analysis will be conducted for each counter-measure component as well as at the sub-system level. Demonstrations will be performed in the following environments: virtual, hardware in the loop, and live fire.</p> <p>Launcher: Matures and demonstrates launcher designs that considers the following aspects: SWaP-C, engagement speed and accuracy, number of launchers, material composition and reliability. The most mature and suitable launcher for the project will be demonstrated in the following environments: virtual, hardware in the loop, and live fire.</p> <p>Sensors: Matures and demonstrates overall sensor suite design (active/passive) that considers the following aspects; radar frequency, power, weight, volume, algorithms, accuracy, search range, tracking and identification time, and passive cueing integration and optimization. The most mature and suitable sensor suite (active/passive) for the project will be demonstrated in the following environments: virtual, hardware in the loop, and live fire.</p> <p>Integration: Demonstrate the matured HK APS sub-systems on a platform in the following environments: virtual, hardware in the loop, and live fire. This will also analyze subsystem and system performance characteristics against Integrated Product Team (IPT) stakeholder requirements. Develop a performance baseline for future hard kill system evaluations.</p> <p>FY 2022 Plans: Will conduct individual Initial Design Reviews for the CM, Launcher and Sensor sub-systems, using previous efforts as a baseline, with industry and government experts. Will integrate CM, Launcher and sensor suite sub-systems based on the Initial Design Reviews including long lead components for future sub-system demonstration and validation. Will begin planning and develop sub-system models to demonstrate the sub-systems in a virtual environment. Will conduct planning for the integration of the CM, Launcher, and Sensor sub-systems into a unified HK APS onto the demonstration platform. Will execute a system level Initial Design Review including the CM, Launcher and Sensor sub-system baselines established in the sub-system Initial Design</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG7 / <i>Ground Systems Active Defense (GSAD) Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Reviews. Will begin planning and integrate an HK APS simulation to represent the system in a relevant environment using previous efforts to demonstrate the HK APS in a virtual environment.</p> <p>FY 2023 Plans: Will improve and optimize the sub-system requirements and design through analysis. Will conduct a down-selection of the countermeasure (CM) warhead, guidance, and other sub-system components. Will mature design of the sensor sub-system, with industry partners, to tailor the performance to meet the requirements of the CM sub-system. Will optimize the system architecture within the established APS framework to ensure components are designed for system compliance and compatibility. Will begin planning virtual tests and demonstrations of the sub-systems. Will continue planning integration of the sub-systems to develop the system-level design.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	1.905	-
Accomplishments/Planned Programs Subtotals		36.496	52.172	60.371
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BG9 / <i>Obscuration Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BG9: <i>Obscuration Advanced Technology</i>	-	10.533	2.511	2.765	-	2.765	2.813	2.810	2.811	2.810	0.000	27.053
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Project matures and demonstrates obscurant technologies with potential to enhance personnel and platform survivability by degrading threat force surveillance sensors and defeating the enemy's target acquisition devices, missile guidance, and directed energy weapons. Dissemination systems for new and improved obscurants are developed with the goal of providing efficient and safe screening of deployed forces. Synthetic Biology Manufacturing technologies in this project will provide Department of Defense (DoD) with the ability to manufacture products such as explosive alternatives and defense-only critical chemicals & materials.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research is performed by the United States (U.S.) Army Futures Command.

Research in this Project is related to and fully coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Obscuration	2.533	2.416	2.765
Description: This effort matures and demonstrates the dissemination of new and advanced obscurants.			
FY 2022 Plans: Will examine packing and dissemination methods of advanced obscuration materials. Will ensure that materials can be safely and efficiently disseminated, and material packing methods geared towards use in obscuration programs .			
FY 2023 Plans: Will conduct field demonstration of a bi-spectral screening obscuration module and transition to Program Manager. Will down-select material coating and conduct flammability testing.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.			
Title: Synthetic Biology Bioprocessing Facility	8.000	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BG9 / <i>Obscuration Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: This effort supports the modernization of the Army's Synthetic Biology Bioprocessing Technology to manufacture pilot scale products such as explosives, obscurants and defense-only critical chemicals & materials. This effort will expedite transitioning products from the new Synthetic Biology Manufacturing Innovation Institute into technology development efforts to support the Department of Defense.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.095	-
Accomplishments/Planned Programs Subtotals	10.533	2.511	2.765

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BH1 / <i>Survivability Systems Controls Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BH1: <i>Survivability Systems Controls Advanced Technology</i>	-	11.880	-	-	-	-	-	-	-	-	0.000	11.880
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project advances the design and capability of the Modular Active Protection System (MAPS) framework and controller to enable integrating emerging survivability technologies into safe and secure configurations and demonstrating them in a representative operational environment. The Project will verify compliance of component sensors and effectors with the modular active protection architecture. This Project ultimately feeds demonstrations of active defense subsystems for demonstration as holistic (vehicle level) solutions. This Project is also a key enabler for insertion of current and future active survivability technologies onto ground platforms in order to combat current and emerging threats.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

This research is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Survivability System Control	11.880	-	-
Description: This effort focuses on maturing and demonstrating a common and open survivability architecture and core implementation to ensure its operational effectiveness. Specifically, this effort includes extending the MAPS architecture across a broader set of active survivability capabilities and increasing the portfolio of MAPS Framework (MAF) compliant technologies. In addition, this project will enhance the government-developed controller subsystem for performance and integration effectiveness with high speed digital signal processing and embedded systems/firmware/software which will be required due to the expanded active defense suite of sensors (e.g., electro-optic, infrared, radio frequency, magnetic, acoustic), sensor fusion, and explore synthesizing sensor data beyond situational awareness to situational understanding with context that can greatly enhance operational effectiveness and vehicle survivability. The activities under this effort provide incremental growth for broader threat spectrum defeat relevant to vehicle protection systems and will be aligned to capability gaps for transition to the acquisition community.			
Accomplishments/Planned Programs Subtotals	11.880	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH1 / <i>Survivability Systems Controls Advanced Technology</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BH4 / Ground Vehicle Holistic Defense Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BH4: Ground Vehicle Holistic Defense Adv Tech	-	-	0.034	-	-	-	-	-	1.427	1.798	0.000	3.259
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will be the basis for a holistic survivability design framework utilizing virtual design models in a Modeling and Simulation (M&S) environment as well as conducting hardware in the loop and live fire demonstration. This Project will inform multiple system level demonstrations to validate that layered survivability technologies are optimized to defeat emerging near-peer threats. Data collected will be used to further validate and verify M&S tools. This Project also provides a design approach available to analyze and adjust the family of protection technologies for combat vehicles in relevant operational theaters.

Research in this Project supports the Next Generation Combat Vehicle 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.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0603462A (Next Generation Combat Vehicle Advanced Technology) / Project BG7 (Ground Systems Active Defense (GSAD) Advanced Tech) and transitions to PE 0604852A (Suite of Vehicle Protection Systems - EMD).

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

	FY 2021	FY 2022	FY 2023
Title: Layered Survivability Demonstration	-	0.033	-
Description: This effort will utilize virtual models in a M&S environment to analyze layered survivability technologies for integration to a demonstration platform. Selected technologies will be demonstrated in a relevant environment to include, virtual, hardware/software in the loop, and live fire environments. This effort will validate that layered Survivability technologies are optimized to defeat threats consistent with the threat defeat capabilities of the selected technologies.			
FY 2022 Plans: Will conduct very limited holistic vehicle defense analysis in support of larger vehicle systems security activities.			
FY 2022 to FY 2023 Increase/Decrease Statement: Change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer	-	0.001	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH4 / <i>Ground Vehicle Holistic Defense Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		-	0.034	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BH6 / Platform Electrification and Mobility Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BH6: Platform Electrification and Mobility Adv Tech	-	20.698	24.891	46.679	-	46.679	63.174	45.417	45.419	40.181	0.000	286.459
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, integrates and demonstrates technologies to electrify both manned and unmanned Next Generation Combat Vehicle platforms. Electrification of these platforms will enable advanced onboard electrified payloads such as directed energy weapons, reduce battlefield fuel consumption, and provide new capabilities such as burst acceleration, extended silent mobility and silent watch. This Project will also mature, integrate and demonstrate technologies to increase electric power such as a high voltage/temperature generator and high power/ temperature power electronics as well as technologies to reduce power demands including composite rubber band track and adaptive hydro-strut suspension.

This Project also continues the Advanced Vehicle Power Technology Alliance (AVPTA) between the Department of Energy and the Department of the Army with a focus on electrification technology that enables military ground vehicles to become significantly more energy efficient. The Alliance is chartered to accelerate the conceptualization and transition into deployment of inventive and creative energy-saving concepts that the Nation needs to achieve energy security.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research is performed by the United States (U.S.) Army Futures Command.

This work complements Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Platform Electrification Technologies	11.069	10.613	11.871
Description: This effort matures and integrates components and sub-systems in order to demonstrate a modular electrification architecture that scales across light to heavy weight classes of combat vehicles.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH6 / <i>Platform Electrification and Mobility Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature the electric sprocket drive system and develop integration software. Will mature thermal management system for a modular high voltage energy storage system. Will mature the diesel-electric power system and thermal management system and develop integration software. Will develop high power electrical components to enable the tactical battlefield recharging capability.</p> <p>FY 2023 Plans: Will validate subsystems for the electric sprocket drive, diesel-electric power system and thermal management system, and demonstrate all sub-systems in a system integration validation laboratory. Will validate supervisory controls for the subsystem controls and integrated system operation. Will perform subsystem integration and laboratory evaluation of a modular high voltage energy storage system. Will mature and improve performance of tactical battlefield recharging technologies. Will continue to improve electric sprocket drive and electric cooling to support Heavy Combat Vehicle electrification requirements.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increased to support application of electric sprocket drive and electric cooling for heavy combat vehicle electrification.</p>				
<p>Title: Advanced Mobility Technologies</p> <p>Description: This effort matures and demonstrates a reduced weight composite running gear system for medium combat vehicle applications which increases operational effectiveness and reduces fuel consumption.</p> <p>FY 2022 Plans: Will exploit composite materials and component designs to significantly reduce running gear system weights. Will reduce integration and supportability concerns with external suspension systems.</p> <p>FY 2023 Plans: Will improve performance of composite track system technology with longer lasting compounds at higher weight carrying capacities. Will optimize external suspension system design to increase mobility performance.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>		3.744	5.606	6.061
<p>Title: Advanced Vehicle Power Technology Alliance - Electrification Technology</p> <p>Description: This effort matures and develops advanced energy storage technologies to improve power and energy performance and safety for vehicles. Higher energy stored with less space and weight increases vehicle efficiency and range. Ensures electrified ground vehicles have enough power for mobility, silent watch, and enables capabilities such as advanced protection, lethality and network capabilities. This effort is a partnership with the Department of Energy.</p> <p>FY 2022 Plans:</p>		2.841	1.992	2.207

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH6 / <i>Platform Electrification and Mobility Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will mature and optimize commercial based energy storage systems to meet military environmental conditions at a module level. FY 2023 Plans: Will improve energy storage module performance and validates performance at the energy pack level. FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle of this effort.				
Title: System/Vehicle Integration and Test Description: This effort integrates advanced mobility, platform electrification components and electrification architecture technologies into surrogate platforms and demonstrates the performance, scalability and modularity of the system approach which will provide the capabilities of silent mobility, improved mobility performance, improved operational duration without re-supply, and provides power to enable integration of advanced protection, lethality and network capabilities. FY 2022 Plans: Will demonstrate sub-system packaging into the surrogate hulls for significantly improved under-armor power density while maximizing system integration for ease of assembly, maintenance, and supportability. FY 2023 Plans: Will demonstrate the electrified system control, performance, and operational energy efficiency through system-level integration and laboratory testing. Will integrate the modular/ scalable electrified system into surrogate platforms for future demonstration. FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects development of systems integration lab for early integration of component technologies.		3.044	2.502	3.983
Title: Scalable Electrification & Control Architecture Technology Description: This effort validates component-level performance and integrates the power distribution and control components to implement a common, scalable, electrified vehicle power architecture to enable analyze layered survivability technologies, high voltage batteries, fast vehicle charging from the grid, and silent mobility on combat platforms from 15 to 50 tons. FY 2022 Plans: Will demonstrate component-level performance of the high voltage power converter and import/export power converter. Will integrate those components into the power subsystem to validate subsystem-level performance. FY 2023 Plans:		-	1.860	3.536

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology	Project (Number/Name) BH6 / Platform Electrification and Mobility Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate component-level performance of high voltage power distribution component that enables electrified powertrains, and integrate that component into the power subsystem to validate subsystem-level performance. Will provide power subsystem software that will take advantage of the new capabilities and use-cases they enable.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle of this effort, moving from component-level demonstration to subsystem integration in a laboratory environment.</p>				
<p>Title: Robotic Combat Vehicle Silent Watch and Mobility Range Extension Advanced Technology</p> <p>Description: This effort matures and demonstrates JP8 reformer components and sub-systems that provide extended silent watch and mobility as part of a modular electrification architecture supporting robotic combat vehicles. The Army's robotic combat vehicles are expected to have increased silent watch and silent mobility requirements that are not met by current technologies.</p> <p>FY 2022 Plans: Will optimize the lightweight anode supported solid oxide fuel cell integration with JP8 reformer and mature from test stand to stand alone operation on a light robotic combat vehicle to increase silent watch and mobility.</p> <p>FY 2023 Plans: Will demonstrate initial JP8 reformer and anode supported solid oxide fuel cell system for a light robotic combat vehicle for increased silent watch and mobility.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding Increase reflects planned lifecycle of this effort.</p>		-	1.409	2.021
<p>Title: Parallel Hybrid Electric Combat System</p> <p>Description: This effort is focused on developing and demonstrating a parallel hybrid electric capability for tracked combat vehicles that will enable silent mobility and improved fuel efficiency.</p> <p>FY 2023 Plans: Will develop architecture and controls to enable a clutch with position sensor necessary for a parallel hybrid tracked combat systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects the development of parallel hybrid electric capabilities for tracked combat vehicles that will improve fuel efficiency and reduce impacts on the climate.</p>		-	-	1.800
<p>Title: Tactical and Wheeled Vehicles Hybrid Electric System</p>		-	-	6.400

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH6 / <i>Platform Electrification and Mobility Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort is part of the climate change initiative to reduce vehicle platform carbon emissions through development of hybrid electric, anti-idle and multi-vehicle power networking capabilities for tactical and wheeled platforms.</p> <p>FY 2023 Plans: Will mature hybrid electric technologies and multi-vehicle power networking node. Will develop integration software for anti-idle, high voltage energy storage, and hybrid functions of regenerative braking, electric launch assist, and mobility optimization. Will develop the supervisory control system that integrates the subsystems into a cohesive propulsion system including motoring and generating. Will develop and integrate a multi-vehicle microgrid dashboard.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects the development of hybrid electric capabilities for tactical wheeled vehicles that will improve fuel efficiency and reduce impacts on the climate.</p>				
<p>Title: Battery Technologies for Supply Chain Security</p> <p>Description: This effort researches technologies that mitigate battery supply chain security issues as it relates to common military form factors that are critical to military ground vehicle electrification and other Army battery applications. This effort is part of a coordinated effort to conduct assessments of technologies across the Defense Advanced Battery Supply Chain along with DoD battery technology projects in PEs 0603342D8Z, 0605798D8Z, 0603680D8Z, 0607210D8Z, 0605805Z, 0603724N, and 0901212N.</p> <p>FY 2023 Plans: Will provide an assessment of industrial base risk in battery component technologies, quantifying the battery designs and common form factors needed to support future capability, and the current risk of exposure of those battery components to foreign supply influence. This assessment will inform follow on research into batteries and battery chemistries and materials that can be domestically sourced. Will begin to mature, integrate, and demonstrate small battery types (such as BB2590 and Small Tactical Universal Battery (STUBS)) in vehicle and other communications-electronics applications to develop a pathway for the adoption of these standard form factor batteries. Will exploit mature 6T common form factor Li-ion (Lithium ion) battery technology to demonstrate alternative uses to accelerate the electrification of other Army and DOD platforms. Will validate capabilities to evaluate commercial energy storage technologies in military vehicle and other conditions.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This increase is to address defense-wide critical battery supply chain security issues that would prevent the Army from fielding electrified vehicle systems.</p>		-	-	8.800
<p>Title: FY2022 SBIR/STTR Transfer</p>		-	0.909	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology	Project (Number/Name) BH6 / Platform Electrification and Mobility Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	20.698	24.891	46.679

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BH8 / <i>Enhanced VETRONICS Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BH8: <i>Enhanced VETRONICS Advanced Technology</i>	-	11.809	14.989	10.776	-	10.776	10.223	10.559	9.317	12.641	0.000	80.314
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates vehicle electronics hardware such as computers, sensors, communications systems, displays, and vehicle command/control/driving mechanisms as well as vehicle software to enhance crew performance, increase vehicle fuel efficiency, reduce Size, Weight, and Power (SWaP) burdens and reduce vehicle maintenance costs. This Project also exploits open system architectures (power and data) for military ground vehicles to enable common interfaces, standards and hardware implementations. The overall vehicle system architecture approach provides an open architecture such as the Vehicle Integration for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance / Electronic Warfare (C4ISR/EW) Interoperability (VICTORY), to allow platforms to accept future technologies without the need for significant re-design as new technologies are developed and integrated. Additionally, this project improves infrastructure that enables the ease of integration of autonomous subsystem technologies into future and existing tactical and combat vehicle architectures. Technical challenges include software and algorithm development for increased levels of automation for both manned and unmanned systems, secure vehicle data networks, interoperability of intra-vehicle and inter-vehicle systems, and implementation of advanced user interfaces. Overcoming these technical challenges enables improved and increased span of collaborative vehicle operations, efficient workload management, commander's decision aids, embedded simulation for battlefield visualization and fully integrated virtual test/evaluation.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Enhanced - Vehicle Electronics (E-Vetronics)	11.809	14.442	10.776
Description: This effort addresses technical and integration challenges in the areas of vehicle architecture and systems integration. Specifically, this effort focuses on maturing and demonstrating a common ground vehicle open architecture with distributed display processing architecture, computing hardware capable of being re-configured to adapt to changes in Input / Output (I/O) needs, advanced network video distribution, advancements in slip ring technology, tactical situational awareness (SA), cooperative engagement and mission package integration through open architecture components and software. These			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BH8 / <i>Enhanced VETRONICS Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>efforts will enable future vehicle capabilities, reduce dependencies on proprietary solutions, and support increased market competition through open architecture components and software. This effort will create the electronics architecture for future ground combat vehicles to enable software and hardware commonality and reduce system integration timing and cost.</p> <p>FY 2022 Plans: Will continue development of architecture, tactical situational awareness, digital containerization, flexible computing I/O and advanced slip ring. Will conduct final demonstration of advanced slip ring and flexible computing I/O technologies, as well as a second bench level demonstration of all available components in an open system architecture. Will develop scalable, modular hybrid electric system architecture for tactical vehicles as well as interfaces to high voltage energy storage modules, power management systems to improve fuel efficiency for military vehicles.</p> <p>FY 2023 Plans: Will improve the ground vehicle common architecture, tactical situational awareness, and digital containerization lines of efforts. Will integrate mission packages for key network functions within the common network architecture. Will demonstrate open system architecture to include objective hardware available to conduct bench level demonstration.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned to Parallel Hybrid Electric Combat System in project BH6 Platform Electrification and Mobility Adv Tech for tactical vehicle hybrid electrification architecture.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.547	-
Accomplishments/Planned Programs Subtotals		11.809	14.989	10.776
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BI3 / Sensor Protection Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BI3: Sensor Protection Advanced Technology	-	1.752	1.645	1.708	-	1.708	1.738	1.738	1.734	1.734	0.000	12.049
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates novel sensor protection capabilities which dramatically reduce the susceptibility of our thermal electro-optic/infrared (EO/IR) sensors to ever increasing threats on the battlefield. This Project enables continuation of the mission despite potential threat laser engagements. Low cost modular solutions will be demonstrated that can be applied across current and planned EO/IR targeting, surveillance, and situational awareness sensor systems against existing and emerging threats in support of combined arms maneuver.

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

Research in this Project supports the Next Generation Combat Vehicle, Soldier Lethality, and Future Vertical Lift Army Modernization Priorities.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology), 0602143A (Soldier Lethality Technology), 0603465A (Future Vertical Lift Advanced Technology) and 0603118A (Soldier Lethality Advanced Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Sensor Protection Advanced Technology	1.752	1.585	1.708
Description: This effort will mature and demonstrate sensor protection and signature reduction capabilities which better ensure sensors are difficult to detect, dazzle, and damage by current and future laser threats.			
FY 2022 Plans: Will mature super window optical coating or material solution with environmental hardening. Will validate protected uncooled microbolometer camera in a relevant environment.			
FY 2023 Plans: Will optimize longwave infrared (LWIR) filter coatings for newly available high sensitivity uncooled bolometer cameras. Will demonstrate effectiveness of visible filter materials against relevant commercially available visible laser threats.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) B13 / <i>Sensor Protection Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding change reflects planned lifecycle of this effort				
Title: FY2022 SBIR/STTR Transfer		-	0.060	-
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		1.752	1.645	1.708
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) B15 / Materials Application and Integration Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
B15: Materials Application and Integration Adv Tech	-	5.286	4.825	5.279	-	5.279	5.478	4.580	4.736	4.734	0.000	34.918
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates lightweight novel materials, and new manufacturing processes and methodologies. These materials and technologies enable the Army to address critical areas of survivability, mobility, and transportability within the Next Generation Combat Vehicle (NGCV).

This Project also continues the Advanced Vehicle Power Technology Alliance (AVPTA) between the Department of Energy and the Department of the Army with a focus on developing advanced materials technologies that enable military ground vehicles to become significantly more energy efficient. The Alliance is chartered to accelerate the conceptualization and transition to deployment of inventive and creative energy-saving concepts that the Nation needs to achieve energy security. This Project matures and integrates lightweight materials and joining technologies in support of lighter military vehicles which are more fuel-efficient and capable in expeditionary scenarios, yet, with superior mobility and protection of both vehicles and occupants.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: System Design Optimization for Lightweighting	4.588	3.992	4.544
Description: This effort improves technologies, tools, and advanced manufacturing techniques in support of the Army's mission to increase mobility, protection, and transportability while reducing weight. This effort focuses on maturing and demonstrating technologies to decrease ground vehicle weight while optimizing performances and enabling the Army trade space for enhanced capabilities. The technologies being demonstrated are in the fields of material maturation, design optimization, operational metrics, joining technologies, and additive manufacturing.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) B15 / <i>Materials Application and Integration Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature and demonstrate advanced/lightweight materials technologies including materials for armor applications, and novel materials for high temperature and high wear surfaces. Will apply integrated computational materials engineering (ICME) tools for improved Modeling & Simulation for virtual prototyping. Will mature and demonstrate advanced manufacturing technologies such as additive manufacturing for design optimization to improve component and sub-system performance, reduce part complexity, and reduce weight. Will validate and demonstrate integration of solid-state materials joining to include joint designs for advanced armor materials.</p> <p>FY 2023 Plans: Will continue to improve the Fiscal Year 2022 (FY22) plan for advanced lightweight armor and high-temperature / high-friction surface materials utilizing improvements made to virtual prototyping, additive manufacturing, and integration / joining techniques. Will mature and demonstrate lightweight, topology optimized ballistic casting for combat weapon systems. Will continue to mature and demonstrate advanced additive manufacturing feedstocks and processes for design optimization to achieve component and sub-system performance metrics, simplify complexity for reduced material waste, and reduce overall weight. Will determine target integration processes for materials joining to include designs for advanced armor materials.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Advanced Vehicle Power Technology Alliance ? Materials</p> <p>Description: This effort matures and demonstrates lightweight materials and joining technologies in support of lighter military vehicles which are more fuel-efficient and expeditionary with superior mobility and protection of both vehicles and occupants. Lighter materials/constructions and advances in joining technologies such as multi-material and dissimilar material joining will lead to lightweight military vehicle structures.</p> <p>FY 2022 Plans: Will mature and demonstrate advanced/lightweight materials for weight optimization, energy storage/transfer, and protection such as FeMnAl (Iron, Manganese and Aluminum alloy) for high hard armor applications, high strength alloy for structural applications, and conductive materials for energy transfer; validate manufacturing, machining, blast/ballistic, dissimilar materials joining/ weldability and corrosion performance for these materials. Will mature and demonstrate wire arc additive manufacturing for design optimization of large ground system components.</p> <p>FY 2023 Plans:</p>		0.698	0.653	0.735

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) B15 / <i>Materials Application and Integration Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will mature and demonstrate advanced/lightweight materials for weight optimization, energy storage/transfer, and protection such as Copper, Tantalum (CuTa) for conductive materials for energy transfer and high temperature alloys for critical engine components. Will also validate manufacturing, machining, and corrosion performance for these materials. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.				
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.180	-
Accomplishments/Planned Programs Subtotals		5.286	4.825	5.279
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BJ1 / Vehicle System Security Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BJ1: Vehicle System Security Advanced Technology	-	1.444	2.455	-	-	-	-	-	-	-	0.000	3.899
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates ground vehicle cyber protection and resilience technologies to increase the cybersecurity of ground vehicles and ensure their continued operation in near-peer cyber contested environments. This Project will mature cybersecurity technologies at the platform level to defeat cybersecurity threats and maintain assured vehicle functionality and freedom of maneuver in the cyber warfighting domain.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Vehicle System Security Advanced Technology	1.444	2.365	-
Description: This effort matures and demonstrates technologies required to maintain operating tempo and overmatch capability during offensive digital attacks to military ground vehicle systems. Additionally, the effort will maintain critical vehicle functionality in peer and near-peer cyber-contested environments. The effort will also mature and demonstrate technologies to mitigate risk of future and emerging cyber vulnerabilities by designing highly assured systems with cybersecurity designed from the beginning.			
FY 2022 Plans: Mature and demonstrate vehicle cybersecurity technologies which verify and validate the functionality of the hardware, software or firmware operation of vehicular microelectronics by identification, logging and notification of any instances of compromised hardware, software or firmware and the corresponding threat mitigation strategies without degrading the vehicle's designed functionality.			
FY 2022 to FY 2023 Increase/Decrease Statement: This project completes in Fiscal Year 2022 (FY22).			
Title: FY2022 SBIR/STTR Transfer	-	0.090	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BJ1 / <i>Vehicle System Security Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	1.444	2.455	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BK1 / Autonomous Mobility Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BK1: Autonomous Mobility Adv Tech	-	11.370	6.087	6.323	-	6.323	5.282	5.286	-	-	0.000	34.348
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates Artificial Intelligence and Machine Learning (AI/ML) technologies to increase autonomy and mobility to perform teamed operations with manned and unmanned air and ground vehicles in a military relevant environment through data collection on relevant platforms. Data collection will involve both simulation and live collection. Simulation will provide a baseline to correctly collect, clean, and analyze data that meets the need for improving algorithms for both formation control and unmanned aerial vehicle map input for unmanned ground vehicle mobility. Live data will start with Surrogate platforms in local areas. This will allow proper collection techniques, tools, and data to maximize embedded autonomy using Machine Learning and other Artificial Intelligent methods before utilizing live data collection. The Project will use AI/ML techniques to mature and demonstrate intelligent formation control to be used on maintained roads and in complex terrain without the need for a global positioning system (GPS). Data will be collected from mounted platforms utilizing special internal and external sensors to improve algorithms for exact positioning, undistributed formation control, and increased speeds of unmanned platforms. Also, the Project will use AI/ML techniques to optimize intelligent autonomous ground platform planning through the use of Unmanned Aerial Systems (UAS) mapped areas. Data collected from air vehicle will be converted to maneuverable information for unmanned ground platform with the identification of enemy positions, go/no-go areas, terrain classification, and optimal suggested paths.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is coordinated with Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Machine Learning Data Collection	5.195	3.261	1.760
Description: This effort matures and demonstrates techniques and technologies for mass unmanned ground vehicle data collection to be used towards Army research in autonomy and mobility with machine learning efforts.			
FY 2022 Plans: Will optimize the data infrastructure for storage of large amounts of robotic ground vehicle data (petabytes) and access by many concurrent users. Will demonstrate the ground robotic data collection process with sensor kits installed on Army ground vehicles.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BK1 / <i>Autonomous Mobility Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature and expand the AI/ML data for robotic ground data vehicles to include new environments and new types of robotic ground vehicle data</p> <p>FY 2023 Plans: Will collect data from sensor and robotic ground vehicles at multiple sites to provide a database of diverse environments and scenarios. Will process the data and ingest it into the project data environment to make it available for visualization, searching, sharing and ML development.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease in Fiscal Year 2023 (FY23) reflects planned lifecycle progression of effort to focus on development of the formation control data-driven techniques in the Formation Control task in this project.</p>				
<p>Title: UAS Mapping</p> <p>Description: This effort matures and demonstrates the use of combined UAS and ground system (UGV) data with ML techniques to develop intelligent unmanned ground system path planning. Data collected from UAS will be converted to maneuverable information for unmanned ground platform to help with the identification of enemy positions, go/no-go areas, terrain classification, and optimal suggested paths.</p> <p>FY 2022 Plans: Will mature the ability to map the terrain, identify obstacles, and characterize the soil from a UAS and share that information with an UGV to better inform its planned maneuver(s). Will demonstrate these capabilities with Army platforms at a relevant Army test site.</p> <p>FY 2023 Plans: Will mature and demonstrate teaming of unmanned air and ground vehicles in challenging environments such as mapping under canopies and in complex terrains with limited line-of-sight to validate the robustness and utility of teamed UAS/UGS to improve mobility in varying scenarios.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY23 funding decrease reflects planned lifecycle progression and maturation of effort as demonstrated in live testing events.</p>		3.275	2.598	1.615
<p>Title: Formation Control</p> <p>Description: This effort uses ML techniques to develop intelligent formation control for manned and unmanned ground vehicles to be used on maintained roads and in contested environments under electronic warfare (EW) and GPS-denied conditions. Data will be collected from mounted platforms utilizing special internal and external sensors to develop and demonstrate algorithms for exact positioning, undistributed formation control, and increased speed.</p>		-	-	2.948

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BK1 / <i>Autonomous Mobility Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2023 Plans:</i> Will perform simulation and data collection and analysis of ML models and algorithms; will collect experimental data while conducting a live demonstration of ML models and algorithms for formation control tactical maneuvers of robotic ground vehicles.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding increase in FY23 reflects planned completion of effort in PE 0602145A (Next Generation Combat Vehicle Technology) / Project BJ9 (Autonomous Mobility Tech) and the planned focus on data-driven development of formation control techniques as ground vehicle data is collected and ingested in the Project's data environment to enable more reliable and robust machine learning models and algorithms for robotic ground vehicle formation control.</p>			
<p><i>Title:</i> Aided Target Recognition - Multiple Cooperative Auto Sensors</p> <p><i>Description:</i> This effort will mature and demonstrate an AI-enabled scalable team of autonomous air and ground vehicles that will cooperatively conduct a zone recon to identify, geolocate, and track threats using on-board electronic intelligence (ELINT) and electro optical-infrared (EO-IR) sensors.</p>	2.900	-	-
<p><i>Title:</i> FY2022 SBIR/STTR Transfer</p> <p><i>Description:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>	-	0.228	-
Accomplishments/Planned Programs Subtotals	11.370	6.087	6.323

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BK4 / <i>Next Gen Intelligent Fire Control(NG-IFC) Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BK4: <i>Next Gen Intelligent Fire Control(NG-IFC) Adv Tech</i>	-	23.205	1.727	2.198	-	2.198	2.309	2.985	-	-	0.000	32.424
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate armament specific hardware, algorithms and architectures to support the Next Generation Combat Vehicle with the necessary fire control on future manned and unmanned platforms.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority .

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is related to and fully integrated with the efforts funded in Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation Intelligent Fire Control	8.903	1.664	2.198
Description: This effort will deliver armament specific hardware, algorithms and architectures to support the Next Generation Combat Vehicle with the necessary fire control on future manned and unmanned platforms.			
FY 2022 Plans: Will demonstrate reduction of engagement timeline by leveraging advances of fire control technologies for extended range engagements through an improved user interface. Will mature hardware to demonstrate a tailored modular architecture framework.			
FY 2023 Plans: Will optimize fire control and modeling characteristics to improve performance of target prioritization models for current and future direct fire platforms. Will mature and demonstrate the model characteristics by assessing performance against specified targets and scenarios.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BK4 / <i>Next Gen Intelligent Fire Control(NG-IFC) Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding increase reflects project plan.				
Title: FIRESTORM Advanced Research		14.302	-	-
Description: Designs and demonstrates networked lethality role-based architecture to support automated decision aids and target handoff capability for combined arms operations. Designs and demonstrates a hybrid distributed architecture that will ingest real-time, prioritized data for decision agents to support scalable operations with reduced processing time.				
Title: FY2022 SBIR/STTR Transfer		-	0.063	-
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		23.205	1.727	2.198
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BK6 / Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BK6: Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech	-	0.224	-	1.534	-	1.534	2.053	9.850	12.613	12.622	0.000	38.896
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies for large caliber direct fire light-weight armament systems that will exceed the current capability of 120 millimeter (mm) direct fire cannons and be optimized for future operational environment with cross-domain engagement capability. Specifically, this Project integrates and demonstrates technologies for rapid fire on-the-move at all elevations (direct & indirect), compact ammunition design with advanced ignition, advanced recoil mitigation to reduce impulse and allow integration onto lighter platforms, automated ammunition handling and reloading. This Project also supports open architecture to enable supervised autonomy and remote operation and integrates intelligent fire control to address multi-domain targets from manned and unmanned platforms.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is performed by the United States (US) Army Futures Command.

Research in this Project is related to and fully integrated with the efforts funded in Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology) and PE 0604115A (Technology Maturation Initiatives).

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

	FY 2021	FY 2022	FY 2023
Title: Large Caliber Armament System (LCAS)	0.224	-	1.534
Description: This effort matures and demonstrates a next generation, automated, lightweight 120-mm armament system design for Next Generation Combat Vehicle, providing tank-like lethality for light medium-weight optionally manned platforms.			
FY 2023 Plans: Will demonstrate integrated technologies for improving lethal performance of direct fire projectiles. Will mature armament tracking algorithms, and enhanced targeting and engagement techniques for direct fire projectiles.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BK6 / <i>Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding resumes in Fiscal Year 2023 (FY23) to demonstrate emerging large caliber direct fire technology from PE 0602145A (Next Generation Combat Vehicle Technology) / Project BK5 (Adv Direct In-Direct Armament Sys (ADIDAS) Tech).			
Accomplishments/Planned Programs Subtotals	0.224	-	1.534

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>				Project (Number/Name) BP6 / <i>Ground Vehicle Advanced Technology(CA)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BP6: <i>Ground Vehicle Advanced Technology(CA)</i>	-	116.200	135.250	-	-	-	-	-	-	-	0.000	251.450
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional Interest Item funding provided for Ground Vehicle Advanced Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Ground Vehicle Advanced Technology.

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 2021	FY 2022
Congressional Add: Additive Manufacturing for Jointless Hull	10.000	15.000
FY 2021 Accomplishments: Conduct advanced research in Additive Manufacturing for Jointless Hull. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Additive Manufacturing for Jointless Hull		
Congressional Add: Carbon Fiber and Graphite Foam Technology	10.000	5.000
FY 2021 Accomplishments: Conduct advanced research in Carbon Fiber and Graphite Foam Technology. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Carbon Fiber and Graphite Foam		
Congressional Add: Hydrogen Fuel Cells	10.000	-
FY 2021 Accomplishments: Conduct advanced research in Hydrogen Fuel Cells. Work executed by Army Futures Command.		
Congressional Add: ATE5.2 Engine Development	10.000	5.000
FY 2021 Accomplishments: Conduct advanced research in ATE5.2 Engine Development.		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BP6 / <i>Ground Vehicle Advanced Technology(CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for ATE5.2 Engine Development		
Congressional Add: Additive Manufacturing of Critical Components FY 2021 Accomplishments: Conduct advanced research in Additive Manufacturing of Critical Components.	5.000	-
Work executed by Army Futures Command. Congressional Add: Combat Vehicle Weight Reduction Initiative FY 2021 Accomplishments: Conduct advanced research in Combat Vehicle Weight Reduction Initiative.	10.000	5.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Combat Vehicle Weight Reduction Initiative Congressional Add: Virtual and Physical Prototyping FY 2021 Accomplishments: Conduct advanced research in Virtual and Physical Prototyping.	10.000	8.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Virtual and Physical Prototyping Congressional Add: HMMWV Autonomy FY 2021 Accomplishments: Conduct advanced research in HMMWV Autonomy.	3.000	-
Work executed by Army Futures Command. Congressional Add: HMMWV Automotive Enhancements FY 2021 Accomplishments: Conduct advanced research in HMMWV Automotive Enhancements.	5.000	3.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for HMMWV Automotive Enhancements Congressional Add: Program Increase - Combat Vehicle Blast Testing FY 2021 Accomplishments: Conduct advanced research in Combat Vehicle Blast Testing.	6.000	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BP6 / <i>Ground Vehicle Advanced Technology(CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Advanced Adhesives FY 2021 Accomplishments: Conduct advanced research in Advanced Adhesives.	5.000	5.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Advanced Adhesives		
Congressional Add: Program Increase - Combat Vehicle Lithium 6T Battery Development FY 2021 Accomplishments: Conduct advanced research in Combat Vehicle Lithium 6T Battery Development.	5.000	5.000
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Combat Vehicle Lithium 6T Battery Development		
Congressional Add: Program Increase - Vehicle Technology Readiness Levels FY 2021 Accomplishments: Conduct advanced research in Vehicle Technology Readiness Levels.	2.000	-
Work executed by Army Futures Command.		
Congressional Add: Program Increase - 10X Technology Demonstration FY 2021 Accomplishments: Conduct advanced research in 10x Technology Demonstration.	8.000	-
Work executed by Army Futures Command.		
Congressional Add: Program Increase - HMMWV Augmented Reality HUD FY 2021 Accomplishments: Conduct advanced research in HMMWV Augmented Reality HUD.	5.000	-
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Operator-in-the-Loop Virtual and Physical Prototyping FY 2021 Accomplishments: Conduct advanced research in Operator-in-the-Loop Virtual and Physical Prototyping.	4.000	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BP6 / <i>Ground Vehicle Advanced Technology(CA)</i>
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Next Generation Electrified Transmission FY 2021 Accomplishments: Conduct advanced research in Next Generation Electrified Transmission.	8.200	-
Work executed by Army Futures Command.		
Congressional Add: Advanced Materials Applications FY 2022 Plans: Congressional Interest Item funding provided for Advanced Materials Applications	-	12.000
Congressional Add: Augmented Reality for Denied Environments FY 2022 Plans: Congressional Interest Item funding provided for Augmented Reality for Denied Environments	-	7.000
Congressional Add: Autonomous Minefield Clearance FY 2022 Plans: Congressional Interest Item funding provided for Autonomous Minefield Clearance	-	7.000
Congressional Add: Autonomous Vehicle Mobility FY 2022 Plans: Congressional Interest Item funding provided for Autonomous Vehicle Mobility	-	10.000
Congressional Add: Carbon Fiber Tires FY 2022 Plans: Congressional Interest Item funding provided for Carbon Fiber Tires	-	5.000
Congressional Add: Force Protection Vehicle Kit FY 2022 Plans: Congressional Interest Item funding provided for Force Protection Vehicle Kit	-	5.000
Congressional Add: Fuel Cell Technology FY 2022 Plans: Congressional Interest Item funding provided for Fuel Cell Technology	-	5.000
Congressional Add: Machine Learning for Advanced Lightweight Combat Vehicle Structures FY 2022 Plans: Congressional Interest Item funding provided for Machine Learning for Advanced Lightweight Combat Vehicle Structures	-	6.000
Congressional Add: Maneuverable Lightweight Electric Weight Reducer	-	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BP6 / <i>Ground Vehicle Advanced Technology(CA)</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Maneuverable Lightweight Electric Weight Reducer		
<i>Congressional Add:</i> Off-Road Maneuver	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Off-Road Maneuver		
<i>Congressional Add:</i> Predictive Maintenance System	-	2.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Predictive Maintenance System		
<i>Congressional Add:</i> RCV-L	-	5.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for RCV-L		
<i>Congressional Add:</i> Short Fiber Thermoplastic Applications	-	4.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Short Fiber Thermoplastic Applications		
<i>Congressional Add:</i> Unmanned Navigational Technology	-	2.500
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Unmanned Navigational Technology		
<i>Congressional Add:</i> Virtual Autonomy Environment	-	3.750
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Virtual Autonomy Environment		
Congressional Adds Subtotals	116.200	135.250

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / Next Generation Combat Vehicle Advanced Technology				Project (Number/Name) BZ9 / Smart Targeting Environment for Lower Level Assets			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BZ9: Smart Targeting Environment for Lower Level Assets	-	3.823	3.920	3.381	-	3.381	4.383	4.393	-	-	0.000	19.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates mission targeting support software and algorithms, to include Electronic Warfare capabilities, leveraged from the Defense Advanced Research Project Agency (DARPA) System-of-System Enhanced Small Unit (SESU), current force, and Science and Technology (S&T) in order to enable small units to continuously build and share targeting data and access strike assets in multi-domain operations.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Small Targeting Environment for Lower Level Assets (STELLA)	3.823	3.775	3.381
<p>Description: This effort matures and demonstrates integrated target search and electronic warfare data dissemination algorithms to speed the overall targeting process. This improved process will utilize automated target search algorithms based on mission parameters to reduce processing time and interface with systems for detecting concealed targets and setting target priority. It will fuse local data processing and payload data to increase accuracy for target engagement, optimize data dissemination algorithms based on local network conditions, and streamline interfaces for small units to access joint strike assets.</p> <p>FY 2022 Plans: Will incorporate development of improved alignment of non-kinetic strike assets and plan for integration into the common operational picture (COP). Will implement tactical procedure software into Mounted Computing Environment/Mounted Mission Command software baselines. Will continue maturing small unit common operating picture procedural software for strike asset planning and tasking alignment both prior to and during missions. Will conduct Soldier touch points and lab/field based demonstrations to assure project is meeting threshold metrics.</p> <p>FY 2023 Plans:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / <i>Next Generation Combat Vehicle Advanced Technology</i>	Project (Number/Name) BZ9 / <i>Smart Targeting Environment for Lower Level Assets</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will implement pairing of electronic warfare target effects in coordination with kinetic effects. Will evaluate additional electronic warfare system use cases and develop end-to-end system demonstrations. Will conduct Soldier evaluations and laboratory and field-based demonstrations to ensure project meets threshold metrics. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease reflects planned lifecycle of this effort.				
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.145	-
Accomplishments/Planned Programs Subtotals		3.823	3.920	3.381
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					PE 0603463A / Network C3I Advanced Technology							
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	215.337	211.068	125.565	-	125.565	107.766	112.285	139.273	151.952	0.000	1,063.246
AM7: Modular RF Communications Advanced Technology	-	12.057	9.270	10.440	-	10.440	-	1.978	13.207	12.683	0.000	59.635
AM9: Protected SATCOM Advanced Technology	-	16.032	25.494	31.660	-	31.660	14.138	-	14.079	15.485	0.000	116.888
AN2: Narrowband SATCOM Advanced Technology	-	4.813	11.590	-	-	-	-	-	-	-	0.000	16.403
AN4: Non Traditional Waveforms Advanced Technology	-	7.508	9.300	5.905	-	5.905	5.192	20.173	11.540	9.104	0.000	68.722
AN6: Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech	-	1.725	-	-	-	-	-	-	-	-	0.000	1.725
AN8: COE - Every Receiver is a Sensor Advanced Tech	-	2.934	2.887	1.371	-	1.371	6.510	6.433	6.435	6.434	0.000	33.004
AO1: UNT - Every Receiver is a Sensor Advanced Tech	-	2.888	2.944	-	-	-	3.156	3.153	3.154	3.153	0.000	18.448
AO3: Stand-In Advanced RF Effects (STARE) Adv Tech	-	2.888	-	-	-	-	-	-	-	-	0.000	2.888
AO6: Tag Track and Locate Small Satellites Adv Tech	-	16.051	-	-	-	-	-	-	-	-	0.000	16.051
AO7: EW for Maneuver Operations (EMO) Adv Tech	-	2.810	5.769	6.142	-	6.142	3.138	1.084	3.136	3.135	0.000	25.214
AP6: C4ISR Integrated Demonstrations Advanced Tech	-	3.603	-	-	-	-	-	-	-	-	0.000	3.603
AP8: Comms/Horiz Int for Army Mod Priorities Adv Tech	-	6.798	-	-	-	-	-	-	-	-	0.000	6.798
AP9: Next Generation HF Advanced Technology	-	6.739	7.730	-	-	-	-	-	-	-	0.000	14.469

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					PE 0603463A / Network C3I Advanced Technology							
AQ1: Spectrum Obfuscation Advanced Technology	-	3.744	-	-	-	-	-	-	-	-	0.000	3.744
AQ5: Sensor CE-Integrated Sensor Architecture Adv Tech	-	1.971	1.645	0.625	-	0.625	1.946	1.966	1.963	1.962	0.000	12.078
AQ8: High Tempo Data Driven Decision Tools Adv Tech	-	2.911	3.099	6.636	-	6.636	3.586	3.762	3.899	3.898	0.000	27.791
AR4: Intelligent Env Battlefield Awareness Adv Tech	-	3.138	4.075	-	-	-	-	-	-	3.643	0.000	10.856
AR6: Understanding the Environment as a Threat Adv Tech	-	2.706	2.524	2.767	-	2.767	2.730	1.682	-	-	0.000	12.409
AR8: Sensing in Contested Environments Adv Tech	-	0.948	1.611	-	-	-	-	-	-	-	0.000	2.559
AS9: Persistent Geophysical Sensing-Infrasound Adv Tech	-	4.600	2.448	-	-	-	-	-	-	-	0.000	7.048
AT3: Subterranean Detection and Monitoring Adv Tech	-	3.360	2.217	-	-	-	-	-	-	-	0.000	5.577
AT8: Network-Enabled GeoSpatial-GEOINT Services AdvTech	-	2.888	3.059	4.603	-	4.603	4.739	4.178	5.416	8.013	0.000	32.896
AU1: Tactical GeoSpatial Information Capabilities ATech	-	3.603	4.207	5.996	-	5.996	2.103	2.702	2.797	5.717	0.000	27.125
AU2: Optimization of Geospatial Data for Visualization	-	2.022	2.171	-	-	-	-	-	-	-	0.000	4.193
AU4: Geospatially Enabled Operational Design Adv Tech	-	7.905	7.956	12.197	-	12.197	10.905	10.731	5.090	5.089	0.000	59.873
AV1: GEOInt/Ops Logistics Integration-Planning Adv Tech	-	3.771	3.867	-	-	-	-	-	-	-	0.000	7.638
AV2: LEO Advanced Technology	-	1.949	-	-	-	-	-	-	-	-	0.000	1.949
AV4: Foundational S&T for Network C3I Advanced Tech	-	2.068	7.751	0.896	-	0.896	0.043	2.268	12.409	16.282	0.000	41.717

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	PE 0603463A / Network C3I Advanced Technology											
AV8: Navigation Warfare (NAVWAR) Advanced Technology	-	2.535	1.927	1.949	-	1.949	6.002	3.958	5.985	-	0.000	22.356
AW4: DoD PNT M&S Collaborative Initiative (CI) Adv Tech	-	2.888	-	-	-	-	-	-	-	-	0.000	2.888
AW6: Modular GPS Independent Sensors Advanced Tech	-	10.684	6.791	10.131	-	10.131	12.289	16.702	14.629	20.609	0.000	91.835
BP4: ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)	-	64.800	55.500	-	-	-	-	-	-	-	0.000	120.300
CF9: Automated IPB Adv Tech	-	-	0.989	-	-	-	-	-	-	-	0.000	0.989
C17: Mobile & Survivable Command Post (MASCP) Adv Tech	-	-	7.809	13.119	-	13.119	18.609	16.332	19.729	19.724	0.000	95.322
CJ8: Assured PNT Communications Advanced Tech	-	-	16.438	11.128	-	11.128	11.640	13.208	13.830	13.903	0.000	80.147
DB6: Pathfinder 3D Advanced Technology*	-	-	-	-	-	-	1.040	1.975	1.975	3.118	0.000	8.108

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates technologies to provide an Army tactical network and enabling infrastructure that support operations in any environment, to include where the electromagnetic spectrum is denied or degraded. This is accomplished through the exploitation and optimization of components and systems for robust, low signature communications and data networks; assured positioning, navigation, and timing in contested environments; converged and coordinated cyber and electronic warfare activities; resilient mission command on the move; and the collection, processing, and dissemination of information for intelligence, surveillance, and reconnaissance in a common operating picture.

Work in this PE complements PE 0602146A (Network C3I Technology), PE 0602143A (Soldier Lethality Technology), PE 0602145A (Next Generation Combat Vehicle Technology), PE 0602147A (Long Range Precision Fires Technology), PE 0602148A (Future Vertical Lift Technology), PE 0602150A (Air and Missile Defense Technology), PE 0602213A (C3I Applied Cyber), PE 0603118A (Soldier Lethality Advanced Technology), PE 0603462A (Next Generation Combat Vehicle Advanced Technology), PE 0603464A (Long Range Precision Fires Advanced Technology), PE 0603465A (Future Vertical Lift Advanced Technology), and PE 0603466A (Air and Missile Defense Advanced Technology).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>
---	--

This PE is directly aligned with the Network and Assured Positioning, Navigation, and Timing (APNT) Army Modernization priorities.

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

Research is performed by the United States (U.S.) Army Futures Command (AFC), the U.S. Army Space and Missile Defense Command (SMDC) and U.S. Army Engineer Research and Development Center (ERDC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	216.520	155.867	0.000	-	0.000
Current President's Budget	215.337	211.068	125.565	-	125.565
Total Adjustments	-1.183	55.201	125.565	-	125.565
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	55.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.183	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	125.565	-	125.565
• FFRDC Transfer	-	-0.299	-	-	-

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

Project: BP4: *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)*

Congressional Add: *Assured Position, Navigation, and Timing Technology*

Congressional Add: *Army Visual and Tactical Arctic Reconnaissance*

Congressional Add: *Program increase - anticipating threats to natural systems*

Congressional Add: *Program Increase - S?UAS cyber threat management*

Congressional Add: *Program Increase - Sub?Surface Infrastructure in Arctic Environments*

Congressional Add: *Program Increase - Mesh Network-Enabled Small Satellites*

Congressional Add: *Program Increase - Geospatial Artificial Intelligence Analytic Tools*

Congressional Add: *Program Increase - Advanced Materials and Technologies for Command Post Modernization*

Congressional Add: *Program Increase - Advanced Materials for Resilient Sensors*

	FY 2021	FY 2022
	6.300	4.000
	2.000	-
	6.000	-
	7.500	-
	1.000	-
	10.000	-
	4.000	-
	10.000	-
	8.000	5.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>
---	--

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

	FY 2021	FY 2022
Congressional Add: <i>Program Increase - Tactical Geospatial Information Capabilities</i>	10.000	5.000
Congressional Add: <i>Alternative Navigation for GPS-Denied Landing Environments</i>	-	4.500
Congressional Add: <i>Edge-High Performance Computing for Multi-Domain Operations</i>	-	5.000
Congressional Add: <i>HALITE</i>	-	7.000
Congressional Add: <i>Next Generation Command Posts</i>	-	10.000
Congressional Add: <i>Receiver-Sensor Technology for Tactical Networks</i>	-	15.000
Congressional Add Subtotals for Project: BP4	64.800	55.500
Congressional Add Totals for all Projects	64.800	55.500

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AM7 / Modular RF Communications Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AM7: Modular RF Communications Advanced Technology	-	12.057	9.270	10.440	-	10.440	-	1.978	13.207	12.683	0.000	59.635
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project optimizes autonomous networking protocols to automate the Primary, Alternate, Contingency, and Emergency (PACE) communication plan to initialize, adapt, and continue operations under changing environments and threats.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AM6 (Modular RF Communications Technology) and PE 0602213A (C3I Applied Cyber) / Project CY1 (Information Assurance and Network Resiliency Tech).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Modular Radio Frequency (RF) Communications Advanced Technology	12.057	8.931	10.440
Description: This effort optimizes autonomous networking protocols to automate the PACE communication plan to initialize, adapt, and continue operations under changing environments and threats.			
FY 2022 Plans: Will optimize the network protocols design for disparate transport networks across multiple security classifications enabling a unified network operations across the Army Brigade network; optimize the algorithms of the decision engine to process data received from external systems; integrate the automated PACE (A-PACE) solution with Program of Record products (e.g. Mounted Mission Command Software and Advanced Field Artillery Tactical Data System (AFAATDS) and other Science and Technology (S&T) products; will use opportunities such as, Network Modernization Experiment (NetMod X), Joint Capabilities Technology Demonstration (JCTD), and Dynamic Front to optimize the design.			
FY 2023 Plans: Will demonstrate automated PACE capabilities in simulated laboratory and field test environments. Will demonstrate integrated PACE capabilities with various nodes; dismounted, mounted, command post and interface to Warfighter Information Network-Tactical (WIN-T) (dismounted and command post node variants completed in Fiscal Year 2020 (FY20), mounted node variant to			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AM7 / Modular RF Communications Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>be completed in FY21/FY22, WIN-T interface to be completed in FY23). Will mature automated PACE decision engine features and demonstrated integration with other protected terrestrial and space-based radios/waveforms and external systems to provide input to the decision engine.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle level of effort for increased maturity and demonstration of PACE communication.</p> <p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>				
		-	0.339	-
Accomplishments/Planned Programs Subtotals		12.057	9.270	10.440
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AM9 / Protected SATCOM Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AM9: Protected SATCOM Advanced Technology	-	16.032	25.494	31.660	-	31.660	14.138	-	14.079	15.485	0.000	116.888
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies and components to increase resiliency of Wideband Satellite Communications (SATCOM) in contested and congested electromagnetic environments. This Project improves resiliency through science & technology investigation. Will compliment technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Projects AM8 (Protected SATCOM Technology).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Protected SATCOM Advanced Technology and Resilient Tactial Networking and Comms	12.223	24.368	31.660
Description: This effort matures and demonstrates technologies and components to increase resiliency of Wideband SATCOM in contested and congested electromagnetic environments. This effort improves resiliency through science & technology investigation. Will compliment technologies that provide obfuscation of RF spectrum signature in order to counter enemy electronic surveillance capabilities.			
FY 2022 Plans: Will mature and demonstrate components that support the control of the Army satellite networks in a contested environment, enabling automated tactical communications resiliency technologies; mature and optimize select SATCOM technologies for basic SATCOM waveforms that will automatically adapt to changing contested environments, leading to protection which improves throughput in tactical and enterprise environments; mature On-the-Move (OTM) satellite ground terminal technology that supports operation over multiple satellite constellations with low available size, weight, and power (SWAP), leading to Army communications resiliency through diversity for tactical vehicles; and mature At-the-Halt (ATH) satellite ground terminal technology that supports operation over multiple satellite constellations simultaneously, leading to Army communications resiliency through diversity for Army Tactical Operations Centers (TOC).			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AM9 / Protected SATCOM Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature and optimize select SATCOM technologies that contribute to SATCOM resiliency; will mature OTM satellite ground terminal technology that supports operation over multiple satellite constellations with low available SWAP, leading to Army communications resiliency through diversity for tactical vehicles; and will mature ATH satellite ground terminal technology that supports operation over multiple satellite constellations simultaneously, leading to Army communications resiliency through diversity for Army TOCs.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects increased support to technology maturation and optimization efforts of OTM and ATH satellite ground terminal technology in support of multiple satellite constellations leading to resiliency through diversity for Army TOCs and vehicles.</p>				
<p>Title: High Altitude: Wideband Global Satellite Communications (WGS) Ka Band Surrogate Payload / Aerial Tier Networking</p> <p>Description: Demonstrate a WGS surrogate payload for usage on a High Altitude Platform (HAP) with seamless transition to existing ground terminals by modifying existing solutions to support Capability Sets (CS), beginning with CS 23: Capacity & Resiliency.</p> <p>FY 2022 Plans: Will validate the potential use of the WGS Surrogate's receive signals to identify and geo-locate adversary electronic warfare threats.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Effort completes in Fiscal Year 2022 (FY22).</p>		3.809	0.193	-
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.933	-
Accomplishments/Planned Programs Subtotals		16.032	25.494	31.660
C. Other Program Funding Summary (\$ in Millions)				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) AM9 / <i>Protected SATCOM Advanced Technology</i>

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

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AN2 / Narrowband SATCOM Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AN2: <i>Narrowband SATCOM Advanced Technology</i>	-	4.813	11.590	-	-	-	-	-	-	-	0.000	16.403
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is Terminated.

A. Mission Description and Budget Item Justification

This Project validates and demonstrates technologies to enable gateway communications across disparate Narrowband Satellite Communications (SATCOM) networks, enabling resiliency in contested environments. The Narrowband SATCOM network is the largest tactical network operated by the Army to provide situational understanding across all echelons. This Project also optimizes technologies and protocols to enable risk mitigation solution sets and awareness through adaptive learning capabilities.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project BZ6 (Narrowband SATCOM Technology).

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

	FY 2021	FY 2022	FY 2023
<p>Title: Narrowband SATCOM Advanced Technology</p> <p>Description: This effort validates and demonstrates technologies to enable gateway communications across disparate Narrowband SATCOM networks, enabling resiliency in contested environments.</p> <p>FY 2022 Plans: Will optimize the Narrowband SATCOM gateway network transport management system to incorporate capabilities such as artificial intelligence, machine learning and cognitive computing; validate system design performance and resiliency in maintaining an acceptable level of communication services; perform integrated demonstrations using multiple use-case scenarios of the Networks, Long Range Precision Fires, Air & Missile Defense and Next Generation Combat Vehicle; and mature system to Technology Readiness Level of 5.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This Project is Terminated in FY23.</p>	4.813	11.166	-
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans:</p>	-	0.424	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AN2 / Narrowband SATCOM Advanced Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement:				
Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		4.813	11.590	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AN4 / Non Traditional Waveforms Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AN4: Non Traditional Waveforms Advanced Technology	-	7.508	9.300	5.905	-	5.905	5.192	20.173	11.540	9.104	0.000	68.722
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates non-traditional waveforms and technologies for resilient communications in contested environments providing anti-jam, low probability of intercept, and low probability of detection for the dismounted and vehicular user. This Project also optimizes technologies not typically applied to the tactical environment, such as millimeter wave communications and directional networking with coherent combining of radio frequency signals, to maintain networked communications in and under contested and congested electromagnetic spectrum environments.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AN3 (Non Traditional Waveforms Technology) and Project AO4 (Energy Efficient Devices Technology).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Non Traditional Waveforms Advanced Technology	7.508	8.960	5.905
Description: This effort demonstrates non-traditional waveforms and technologies for resilient communications in contested environments providing anti-jam, low probability of intercept, and low probability of detection for the dismounted and vehicular user. This effort optimizes technologies not typically applied to the tactical environment, such as millimeter wave communications and directional networking with coherent combining of radio frequency signals, to maintain networked communications in and under contested and congested electromagnetic spectrum environments.			
FY 2022 Plans: Will mature anti-jam and low probability of intercept, low probability of detection communications capabilities for protected communications to be better suited for operationally relevant, contested environments; enable directional millimeter wave communications to support additional users in complex scenarios (e.g. on-the-move high speed directional ad-hoc network at operational distances); exploit and mature government owned millimeter wave antenna aperture to reduce the unit cost of mmW communications systems; apply techniques developed in previous years, (cooperative beamforming for voice and data communications) and enable upgrade of a legacy waveform(s) via software/firmware update only; and enhance waveform			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AN4 / Non Traditional Waveforms Advanced Technology

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
protection in contested environments using methods, such as combining cooperative beamforming with additional anti-jam low probability of intercept, low probability of detection techniques. FY 2023 Plans: Will mature tactical millimeter wave communications to technology readiness level (TRL) 6. Will mature the robustness of the solution for increased reliability in on-the-move scenarios including support for vehicular (ground based) relay nodes. Will develop and integrate improved hybrid beamforming (or active electronically scanned array) antennas to increase line-of-sight range and further reduce low probability of intercept/low probability of detection capability. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease in Fiscal Year 2023 (FY23) reflects planned lifecycle efforts to advance tactical millimeter wave communications technology and maturation to TRL 6.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.340	-
Accomplishments/Planned Programs Subtotals	7.508	9.300	5.905

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AN6 / Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AN6: Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech	-	1.725	-	-	-	-	-	-	-	-	0.000	1.725
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures technologies providing increased resiliency for Wideband Satellite Communications (SATCOM) from contested and congested electromagnetics through the use of technologies including adaptive interference mitigation and diversity through multiple paths. Wideband SATCOM is the primary high-bandwidth Beyond Line of Sight (BLOS) communications used by the tactical Army and this Project demonstrates protection of this valuable communication link.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech	1.725	-	-
Description: This effort matures technologies providing increased resiliency for Wideband SATCOM from contested and congested electromagnetics through the use of technologies including adaptive interference mitigation and diversity through multiple paths. Wideband SATCOM is the primary high-bandwidth BLOS Communications used by the tactical Army and this project demonstrates protection of this valuable communication link.			
Accomplishments/Planned Programs Subtotals	1.725	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AN8 / COE - Every Receiver is a Sensor Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AN8: COE - Every Receiver is a Sensor Advanced Tech	-	2.934	2.887	1.371	-	1.371	6.510	6.433	6.435	6.434	0.000	33.004
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project optimizes automated exploitation and fusion analysis tools, applications, and software services that harvest, correlate and fuse tactical receiver sources with new and emerging data sources to improve understanding of the threat picture and more efficiently support near-real time Situational Understanding of the battlefield.

Research in this Project complements Program Element (PE) 0603463A (Network C3I Advanced Technology) / Project AO1 (UNT - Every Receiver is a Sensor Advanced Tech) and PE 0602146A (Network C3I Technology) / Project AN7 (COE - Every Receiver is a Sensor Tech).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Data Analytics for Situational Awareness	2.934	2.782	-
Description: This effort improves software technologies for intelligence/mission command (MC) mission collaboration to provide faster and higher quality decision-making support for the commander and his key staff. Specific efforts focus on integrating intelligence, surveillance and reconnaissance (ISR) planning and execution at the Task Force/Battalion through troop-level, as well as efforts that provide the capability to identify, fuse, and trace/track specific targets in an asymmetric environment.			
FY 2022 Plans: Will add and demonstrate enhanced attribute and cell level security capabilities within the converged intelligence and operations platform to show functionality across different classification boundaries; Will integrate machine learning frameworks to demonstrate machine learning capabilities within the converged platform; Will demonstrate tactical distributed Processing, Exploitation, and Dissemination (PED) workflows and efficient data synchronization at lower echelons by developing and demonstrating Tactical Edge data synchronization to support the Disconnected, Intermittent, and Limited (DIL) environment.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned conclusion of this task.			
Title: Intelligence, Surveillance and Reconnaissance Optimization for Multi-Domain Operations Support Advanced Tech	-	-	1.371

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AN8 / COE - Every Receiver is a Sensor Advanced Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort will use automated threat process to focus sensor collection requirements. Collection plans are to be synchronized across echelons optimizing scheduling and placement of sensor assets from both national and joint capabilities.</p> <p>FY 2023 Plans: Will evaluate sensor optimization algorithms. Will evaluate external interfaces of Program of Record (PoR) collection management platforms.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned initiation of this task.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.105	-
Accomplishments/Planned Programs Subtotals		2.934	2.887	1.371
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AO1 / UNT - Every Receiver is a Sensor Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AO1: UNT - Every Receiver is a Sensor Advanced Tech	-	2.888	2.944	-	-	-	3.156	3.153	3.154	3.153	0.000	18.448
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this project has a funding skip year.

A. Mission Description and Budget Item Justification

This Project demonstrates high fidelity Cyber-Electromagnetic Activity (CEMA) situational understanding by exploiting tactical receivers with sufficient capabilities as sensors. This Project also optimizes real-time radio frequency mapping of the tactical environment in support of network operation and decision making.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Projects AN9 (UNT - Every Receiver is a Sensor Technology) and Project AN7 (COE - Every Receiver is a Sensor Technology); and PE 0603463A (Network C3I Advanced Technology) / Project AN8 (COE Every Receiver is a Sensor Advanced Tech).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Multi Intelligence Modernization supporting Multifunction Operations	2.888	2.837	-
Description: This effort will optimize Intelligence Community investments in software frameworks and exploits against threat signals of interest (SOI) to mature a library of open, modular, and scalable software solutions that address identified capability gaps and to provide the commander with electronic situational awareness while at the same time protecting his assets from enemy deception and jamming.			
FY 2022 Plans: Demonstrate Electronic Warfare payloads designed to operate from high altitude, long endurance platforms; mature and demonstrate small, form factor hardware standards to facilitate the use of modular hardware on small Size, Weight and Power (SWAP) platforms such as high altitude, long endurance platforms and small, unmanned aerial vehicles.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AO1 / UNT - Every Receiver is a Sensor Advanced Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
In Fiscal Year 2023 (FY23) this Project has a funding Skip Year.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.107	-
Accomplishments/Planned Programs Subtotals	2.888	2.944	-

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

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AO3 / Stand-In Advanced RF Effects (STARE) Adv Tech
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AO3: Stand-In Advanced RF Effects (STARE) Adv Tech	-	2.888	-	-	-	-	-	-	-	-	0.000	2.888
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies and capabilities to provide robust and reliable communications capabilities by leveraging commercial technologies and enhancing their operation to maintain network connectivity in contested and congested environments.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AO2 (Stand-In Advanced RF Effects (STARE)).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Stand-In Advanced Radio Frequency (RF) Effects Advanced Technology	2.888	-	-
Description: This effort harvests investments from Applied Research component level maturation and hardware synchronization research, to mature hardware for demonstration of capabilities for distributed Electronic Warfare.			
Accomplishments/Planned Programs Subtotals	2.888	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AO6 / Tag Track and Locate Small Satellites Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AO6: Tag Track and Locate Small Satellites Adv Tech	-	16.051	-	-	-	-	-	-	-	-	0.000	16.051
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates payloads, sensors, and data down link systems for tactically responsive Space and High Altitude platforms supporting Army ground forces. This Project matures, demonstrates, and integrates lightweight materials, hardware components with reduced power consumption, and advanced data collection, processing, and dissemination capabilities. This Project also improves algorithms that process space and near space sensor data in real and near real time for integration into battlefield operating systems including a technical demonstration of a sensor designed to provide space-based situational awareness to the tactical Warfighter; Development and demonstration of small satellite capabilities, which include classified payloads, to provide Assured Positioning, Navigation, and Timing services to the tactical ground component Warfighters; Constellation of space-based sensors that provide Reconnaissance, Surveillance, and Target Acquisition (RSTA) and Situational Awareness (SA) to the ground force commander to support Multi-Domain Operations (MDO); Applied research in quantum sciences based communications, sensing, and data teleportation to mature current technologies for small spacecraft applications.

These efforts support the Army's ability to control and exploit space assets that contribute to current and future military operations as defined in the national, Department of Defense (DOD), and Army future space strategies.

The Research completed under this Project supports the Army Modernization Priorities.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AO5 (Tag Track and Locate Small Satellites Technology).

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

Research in this Project is performed by the United States Army Space and Missile Defense Command (USASMDC) Technical Center (TC).

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

	FY 2021	FY 2022	FY 2023
Title: Tag, Track, and Locate Small Satellites	16.051	-	-
Description: This effort matures and demonstrates technologies required for smaller, warfighter-responsive sensor and communication Low Earth Orbit (LEO) small satellite constellations. Work will augment, improve, exploit and optimize existing commercial and DoD technologies and networks. This effort also validates software, hardware, and algorithms used to enable space-based capabilities in support of the Army's Modernization Priorities. This effort will exploit commercial advances and opportunities in small satellite constellation and payload management toward future Army concepts.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AO6 / Tag Track and Locate Small Satellites Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Accomplishments/Planned Programs Subtotals	16.051	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AO7 / EW for Maneuver Operations (EMO) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AO7: EW for Maneuver Operations (EMO) Adv Tech	-	2.810	5.769	6.142	-	6.142	3.138	1.084	3.136	3.135	0.000	25.214
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies that understand contested spectrum features, sense, locate, and cue fires missions to create windows of opportunity in Anti-Access/ Area Denial (A2/AD) environments, restore network capabilities, and enable maneuver and fires.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / AP5 (Electronic Warfare Technology).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Electronic Warfare (EW) for Maneuver Ops Description: This effort matures and demonstrates hardware and software to conduct EW for intelligence, surveillance, and reconnaissance (ISR) in support of Army tactical operations. FY 2022 Plans: Will mature (i.e., technology readiness level 6) and demonstrate EW capabilities for use against sensor systems in representative environments, threats, and hardware; and flight-demonstrate distributed and coordinated capabilities for novel geolocation. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned conclusion of this effort.	1.601	1.672	-
Title: Simultaneous Countermeasure for Active Reconnaissance and Surveillance (SCARS) Description: This effort matures and demonstrates EW capabilities leveraging hardware-in-the-loop and modeling and simulation (M&S) of threat ISR systems to validate coordinated and collaborative non-kinetic effects.	1.209	-	-
Title: Stand-in Advanced RF Effects Advanced Technology Description: This effort matures and demonstrates highly advanced hardware and software to improve power-on-target for EW systems against certain threat systems.	-	2.698	3.078

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AO7 / EW for Maneuver Operations (EMO) Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans: Will mature and optimized synchronization hardware, advanced signal processing, and EW system designs for distributed EW. Field demonstrate hardware system improvements to validate the effectiveness of distributed EW against certain classes of threat systems.</p> <p>FY 2023 Plans: Will demonstrate Array Control Payload synchronization capabilities for distributed EW techniques. Will demonstrate complex waveforms capability at a technology readiness level (TRL) 6. Will deliver an engineering design unit for cooperative networked electronic warfare.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>			
<p>Title: Tactical Force Signature Effects (TForSE) Advanced Technology ? Counter ISR Techniques</p> <p>Description: This effort matures and demonstrates Electronic Warfare capabilities against adversary counter-fire sensors and Intelligence, Surveillance, and Reconnaissance (ISR) systems leveraging high fidelity hardware-in-the-loop, modeling and simulation (M&S), and representative systems.</p> <p>FY 2022 Plans: Will mature initial EW capabilities against adversary systems that provide battlefield situational understanding and localization; and validate EW effectiveness in laboratory or representative environments to mask and deceive blue locations.</p> <p>FY 2023 Plans: Will integrate advanced apertures and decoy techniques into complex modeling and simulation scenarios to prove efficacy in a contested operating environment. Will demonstrate advanced aperture and decoy techniques via a field validation exercise to be determined</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase supports maturation of advanced aperture and decoy techniques.</p>	-	1.187	3.064
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>	-	0.212	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AO7 / EW for Maneuver Operations (EMO) Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	2.810	5.769	6.142

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AP6 / C4ISR Integrated Demonstrations Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AP6: C4ISR Integrated Demonstrations Advanced Tech	-	3.603	-	-	-	-	-	-	-	-	0.000	3.603
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Provides System of Systems (SoS) engineering rigor on Science & Technology (S&T) projects by providing field-based risk reduction processes, quantifiable technology performance in a SoS context, data-driven programmatic decision support, and field-based performance data to supplement Technology Readiness Level (TRL) assessments.

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Integrated Demonstrations Advanced Tech	3.603	-	-
Description: This effort provides appropriate SoS engineering rigor for multiple S&T projects by providing field-based risk reduction processes, quantifiable technology performance in a SoS context, data-driven programmatic decision support, and field-based performance data to supplement Technology Readiness Level Assessments. This effort provides network automation, resiliency, and situational understanding through S&T advancements.			
Accomplishments/Planned Programs Subtotals	3.603	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AP8 / Comms/Horiz Int for Army Mod Priorities Adv Tech
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AP8: Comms/Horiz Int for Army Mod Priorities Adv Tech	-	6.798	-	-	-	-	-	-	-	-	0.000	6.798
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides unified communications for the Army's modernization priorities through operationally-relevant, end-to-end network demonstrations which leverage Science & Technology (S&T) and commercial technology adapted to mitigate performance gaps in the presence of electronic warfare (EW) systems and reduce network complexity.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AP7 (Comms/Horiz Int for Army Mod Priorities Tech).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Communications Support to Army Modernization Priorities/Horizontal Integration Fields Advance Technology	6.798	-	-
Description: This effort provides unified communications for the Army's modernization priorities through operationally-relevant, end-to-end network demonstrations which leverage S&T and commercial technology adapted to mitigate performance gaps in the presence of EW systems and reduce network complexity.			
Accomplishments/Planned Programs Subtotals	6.798	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AP9 / Next Generation HF Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AP9: Next Generation HF Advanced Technology	-	6.739	7.730	-	-	-	-	-	-	-	0.000	14.469
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project has completed.

A. Mission Description and Budget Item Justification

This Project improves performance of technologies to provide assured and resilient reach-back communications in satellite denied or degraded environments. This Project optimizes performance of new high frequency (HF) technology to provide low probability of detection and anti-jam capabilities to overcome emerging electronic warfare threats.

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation HF Advanced Technology	6.739	7.444	-
Description: This effort improves performance of technologies to provide assured and resilient reach-back communications in satellite denied or degraded environments. This effort optimizes performance of HF technology to provide low probability of detection and anti-jam capabilities to overcome emerging electronic warfare threats.			
FY 2022 Plans: Will enhance the HF Communications Hub and mature the edge terminal HF radio hardware and software to provide an assured, resilient, alternate beyond line-of-sight communications link for tactical and strategic Army assets; conduct technology readiness level 6 demonstration in a beyond line-of-sight operationally relevant environment of the HF Communications Hub proof-of-concept operating with legacy HF radios, other edge radio terminals, and the Regional Hub Node integrated into the larger tactical network executing mission threads; provide final assessment of performance from technology demonstration and provide recommendations to transition organizations; assess the performance against pacing threats in satellite denied and area denied environments to determine the increased resiliency to enemy detection and interception.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AP9 / Next Generation HF Advanced Technology

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
In FY23 this effort has completed.			
Title: FY2022 SBIR/STTR Transfer	-	0.286	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	6.739	7.730	-

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AQ1 / Spectrum Obfuscation Advanced Technology
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AQ1: <i>Spectrum Obfuscation Advanced Technology</i>	-	3.744	-	-	-	-	-	-	-	-	0.000	3.744
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project validates and demonstrates technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities. This Project optimizes, matures and demonstrates novel materials, technologies, techniques and applications that increase camouflage and concealment capabilities against known and emerging sensor threats, provide effective deception capabilities, increase survivability, mature analytical processes for modeling performance of signature management technologies during multi-domain operations as well as developing combinations of physical and electronic signature decoy components. These technologies will produce proof of concept system demonstrators that decrease the probability of detection and targeting by peer and near-peer adversaries, enabling freedom of movement of semi-independent and dispersed formations

Research in this Project complements Program Element (PE) 0603463A (Network C3I Advanced Technology) / Project CI7 (Mobile & Survivable Command Post (MASCP) Adv Tech) and 0603118A (Soldier Lethality Advanced Technology) / Project AZ6 (Soldier Signature Management Advanced Technology).

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Camouflage, Concealment and Deception	3.744	-	-
Description: This effort demonstrates innovative camouflage, concealment and deception technologies for expeditionary assets (i.e. mission command platforms, battle management centers and supporting equipment) to defeat advanced current and emerging adversary Intelligence, Surveillance and Reconnaissance (ISR) threats, and to reduce the probability of detection in multi-domain operations. Matures physics-based models for material and system performance that support probability of detection metrics in the multi-domain operational environment, assisting in closing the capability gap between current camouflage, concealment and deception technologies and defeating enemy sensorial capabilities in future operating environments.			
Accomplishments/Planned Programs Subtotals	3.744	-	-

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

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) AQ1 / <i>Spectrum Obfuscation Advanced Technology</i>

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

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AQ5 / Sensor CE-Integrated Sensor Architecture Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AQ5: Sensor CE-Integrated Sensor Architecture Adv Tech	-	1.971	1.645	0.625	-	0.625	1.946	1.966	1.963	1.962	0.000	12.078
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a sensor interoperability architecture consisting of standards, interfaces, and services.

Research in this Project supports the Army Science and Technology Network, Next Generation Combat Vehicle, Soldier Lethality, Air and Missile Defense, Long Range Precision Fires and Future Vertical Lift modernization priorities.

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

Research in this Project is performed by the Unites States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Sensor CE - Integrated Sensor Architecture	1.971	1.585	0.625
Description: This effort matures and demonstrates an agile and adaptive interoperability sensor architecture that allows a system to dynamically discover and leverage other systems on a network without any specific or prior knowledge across limited, heterogeneous resources and against a peer adversary. The goal of this effort is to develop standards, models, and protocols that provide a common language for sensor systems to connect, publish their capabilities and needs, and interact with other systems, even on disadvantaged networks. The benefits of this effort are increased sensor collaboration, reduced decision timelines, reduced soldier load, and reduced integration costs.			
FY 2022 Plans: Will optimize network awareness technologies to improve bandwidth utilization for sensor interoperability; will demonstrate dynamic allocation of resources to show the correct sensor data assisting in providing targeting information to effectors.			
FY 2023 Plans: Will demonstrate intelligent subscription services and effect on data distribution to show reduced time for a sensor to be discovered on a network. Will optimize approaches for sensor to shooter data confidence to enable validation and de-confliction of multiple target indicators.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AQ5 / Sensor CE-Integrated Sensor Architecture Adv Tech
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding decrease reflects reduction in automatic redundancy efforts.			
Title: FY2022 SBIR/STTR Transfer	-	0.060	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	1.971	1.645	0.625

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AQ8 / High Tempo Data Driven Decision Tools Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AQ8: High Tempo Data Driven Decision Tools Adv Tech	-	2.911	3.099	6.636	-	6.636	3.586	3.762	3.899	3.898	0.000	27.791
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates data driven decision tools that help develop cyber situational understanding (SU) for Commanders. It enhances decision-making and accurately assesses and integrates cyber impacts with all of the domains in Multi-Domain Operations (MDO) and thereby enhances mission effectiveness by improving decision cycles.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AQ7 (High Tempo Data Driven Decision Tools Technology).

The cited research 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 2021	FY 2022	FY 2023
Title: High Tempo Data Driven Decision Tools Advanced Technology	2.911	2.985	3.319
<p>Description: This effort matures and demonstrates data driven decision tools tailored to reflect specific mission / information needs of the commander and individual staff members comprised of the following: software that facilitates the exchange of cyber data and mission information between the cyber electromagnetic activities (CEMA) cell, the S-6 and other staff officers (e.g., S-3, S-2, Fire Support Officer (FSO)), helping to assess higher-level impacts of lower-level events, and capturing the information as part of models for possible re-use; and software that dynamically populates the Common Operating Picture (COP) with visualizations designed for exploration and understanding of the impact of the cyber domain on the current mission.</p> <p>FY 2022 Plans: Update COP Visualizations based on soldier/stakeholder feedback; develop cyber visualization guides to inform COP Visualization development; incorporate additional commander's cyber needs into COP Visualizations; demonstrate improved cyber SU in S-6 / S-3 / Commander perspectives and collaboration in field environment and dynamically connect to canned data; demonstrate that the Collaborative Cyber Understanding software dynamically updates the COP Visualizations and cyber decision models; conduct a soldier evaluation of cyber decision model (cyber workflow/decision making process).</p> <p>FY 2023 Plans: Will develop software that connects to available and live data sources in a field environment for a soldier Collaborative Cyber Understanding demonstration. Will further mature existing and new cyber data sources, cyber avenues of approach and the cyber data visualization tool based on experimentation feedback. Will demonstrate that the Collaborative Cyber Understanding software</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AQ8 / High Tempo Data Driven Decision Tools Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
dynamically updates the COP Visualizations and cyber decision models; Will conduct a soldier demonstration of cyber decision model (cyber workflow/decision making process). FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.				
Title: RoadRunner Advanced Technology Description: This effort matures and demonstrates stakeholder prioritized capabilities that fuse intel and ops perspectives that drive decisions to enable dominance in complex Multi-Domain Operations. FY 2023 Plans: Engagements with peer/near-peer and highly technical adversaries will reveal new vulnerabilities and opportunities. Using a concurrent Development, Security and Operations (DEVSECOPS) environment, will develop and demonstrate optimal strategies in friendly versus enemy engagements using digitized plans and real-time decision support providing exposure to non-obvious insights, vulnerabilities, and opportunities during planning and execution phases. FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 this effort will build upon the High Tempo Data Driven Decision Tools effort to include the fusion of intelligence and operations information that enable faster decision making process		-	-	3.317
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.114	-
Accomplishments/Planned Programs Subtotals		2.911	3.099	6.636
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AR4 / Intelligent Env Battlefield Awareness Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AR4: <i>Intelligent Env Battlefield Awareness Adv Tech</i>	-	3.138	4.075	-	-	-	-	-	-	3.643	0.000	10.856
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603042A (C3I Advanced Technology) / Project CX7 (Intelligent Env Battlefield Awareness Adv Tech).

A. Mission Description and Budget Item Justification

This Project demonstrates and optimizes technologies to allow Soldiers to maneuver faster around or through existing environmental (urban/industrial) conditions and physical landscape constraints. This Project also matures and demonstrates web modules/software tools delivering crucial geo-chemical resources and advanced knowledge of geo-environmental infrastructure to mission planners.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AR3 (Intelligent Environmental Battlefield Awareness).

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center.

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

	FY 2021	FY 2022	FY 2023
Title: Geo-Forensics for Reconnaissance Exploitation	1.503	1.142	-
Description: This effort provides unique terrestrial patterns to describe and predict the geological, biological, and overall ecological information associated with anti-access/area denial (A2/AD) sites from the continental U.S. (CONUS) analogs.			
FY 2022 Plans: Mature search algorithms to match global analogs, ?smart? interpolation function, and expand search criteria by desired geochemical characteristics.			
FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 this Project is realigned to PE 0603042A (C3I Advanced Technology) / Project CX7 (Intelligent Env Battlefield Awareness Adv Tech).			
Title: Arctic Threat Demonstrations	1.635	1.237	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AR4 / Intelligent Env Battlefield Awareness Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: This effort matures and demonstrates visualization tools which enable geospatial decisions based on anticipated physical threats, hazards and dependencies posed by terrain and weather extremes in cold regions.</p> <p>FY 2022 Plans: Demonstrate environmental prediction algorithms to accurately assess ice structure, permafrost and freeze thaw events for operational movement.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 this Project is realigned to PE 0603042A (C3I Advanced Technology) / Project CX7 (Intelligent Env Battlefield Awareness Adv Tech).</p>			
<p>Title: Predictive Geographic Information System (GIS) Mapping (physical) Demonstration</p> <p>Description: This effort reduces the impact of unknown and changing terrain conditions by automating the integration of disparate datasets and overlays of terrain obstacles producing a high-fidelity map that integrates soil composition, vegetation, hydrology, and permafrost/ice data.</p> <p>FY 2022 Plans: Demonstrate a comprehensive database of input and output variables used across terrain (soil, hydrologic, and arctic) models and identify compatible integration points.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 this Project is realigned to PE 0603042A (C3I Advanced Technology) / Project CX7 (Intelligent Env Battlefield Awareness Adv Tech).</p>	-	1.548	-
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.148	-
Accomplishments/Planned Programs Subtotals	3.138	4.075	-

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

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Tec hnology	Project (Number/Name) AR4 / Intelligent Env Battlefield Awareness Adv Tech

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

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AR6 / Understanding the Environment as a Threat Adv Tech
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AR6: <i>Understanding the Environment as a Threat Adv Tech</i>	-	2.706	2.524	2.767	-	2.767	2.730	1.682	-	-	0.000	12.409
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates tools that provide capability to inform the Soldier of different routes through a complex urban landscape. Optimizes tools that balance exposure to environmental threats with mission constraints to provide a risk versus reward capability of operating in different areas of the urban theater. This Project matures and demonstrates predictive software accurately integrating the risks of physical, chemical, and biological threats in an urban environment into route planning tools.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) Project AR5 (Understanding the Environment as a Threat Technology).

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

Research in this Project is performed by the Engineer Research and Development Center.

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

	FY 2021	FY 2022	FY 2023
Title: Environmental Threat Technology Demonstrations for route planning	1.357	1.288	1.030
<p>Description: This effort matures and demonstrates a software tool that informs and balances the risk of exposure to environmental threats with maneuver constraints along potential routes. The software integrates the risks associated with different environmental matrices in complex urban environments and includes the capability for routing in off-road scenarios.</p> <p>FY 2022 Plans: Mature and validate a risk-course forecasting algorithms that account for dynamics and persistence of toxic industrial chemicals and materials (TIC/Ms) in air, water, and soil in denied urban terrain.</p> <p>FY 2023 Plans: Will demonstrate the next-phase capability of minimally-viable weighted risk course forecasting algorithms based on sorption/ degradation products in air, water and soil.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AR6 / Understanding the Environment as a Threat Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding decrease reflects the planned lifecycle of this effort as resources are focused on subsurface forensics demonstrations within this Project.				
<p>Title: Hazard Prediction Demonstration</p> <p>Description: This effort matures and demonstrates a mission planning platform that provides Soldiers with a predictive visualization technology to identify, track and plan for industrial or commercial chemical/environmental threats in operational environments.</p> <p>FY 2022 Plans: Mature and demonstrate developed algorithms that integrate contaminant mobility based on hydrology and soils and the sorption/ degradation products.</p> <p>FY 2023 Plans: Will demonstrate next-phase capability based on review and critiques of minimally-viable hazard prediction models of TIC/Ms in air, water, and soil in denied urban terrain.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease reflects the planned lifecycle of this effort as resources are focused on subsurface forensics demonstrations within this Project.</p>		1.349	1.044	1.022
<p>Title: Subsurface Forensics Demonstration</p> <p>Description: This effort matures and demonstrates sensing technologies for TIC/Ms to detect illicit activities with authentic wastewater treatment influent.</p> <p>FY 2022 Plans: Mature data transmission capabilities from sensor through sewer systems and determine interoperability with commercial off the shelf robotic platforms.</p> <p>FY 2023 Plans: Will demonstrate sensor communication systems through sewer structures to determine minimal autonomous viable robotic platform for sensor suite.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Planned funding increase reflects adjustments to develop and mature sensor communication systems that meet operational requirements found in complex urban landscapes.</p>		-	0.100	0.715
Title: FY 2022 SBIR/STTR Transfer		-	0.092	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AR6 / Understanding the Environment as a Threat Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		2.706	2.524	2.767
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology			Project (Number/Name) AR8 / Sensing in Contested Environments Adv Tech				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AR8: Sensing in Contested Environments Adv Tech	-	0.948	1.611	-	-	-	-	-	-	-	0.000	2.559
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603042A (C3I Advanced Technology) Project CX9 (Sensing in Contested Environments Adv Technologies).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced sensor technologies that characterize hazards posed to warfighters by non-weaponized biological hazards in subterranean environments. The Project will demonstrate adaptive commercial off the shelf sensor technologies on existing unmanned ground vehicles (UGV) platforms to gather end-user feedback.

Research in this Project complements (PE) 0602146A (Network C3I Technology) / Project AR7 (Sensing in Contested Environments Technology).

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Non-Traditional Threat Detection Advance Technology	0.948	1.552	-
Description: This effort matures and demonstrates combined commercial off the shelf capabilities from multiple sources as an integrated robotic-operable expeditionary kit for accurate detection of biological hazards for early warning in subterranean environments from point of ingress/egress prior to exposure.			
FY 2022 Plans: Demonstrate an integrated optical sensor platform capable of identification of relevant environmental threats.			
FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603042A (C3I Advanced Technology) Project CX9 (Sensing in Contested Environments Adv Technologies).			
Title: FY 2022 SBIR/STTR Transfer	-	0.059	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AR8 / Sensing in Contested Environments Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		0.948	1.611	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AS9 / Persistent Geophysical Sensing-Infrasound Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AS9: Persistent Geophysical Sensing-Infrasound Adv Tech	-	4.600	2.448	-	-	-	-	-	-	-	0.000	7.048
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603042A (C3I Advanced Technology) Project CX8 (Persistent Geophysical Sensing-Infrasound Adv Tech).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates kitted hardware and software solutions that persistently monitor (through non-line-of-sight sensing including infrasound) critical infrastructure conditions and threat activities in dynamic battlefields. These technologies provide near real time data collection, processing, and alerts of infrastructure go/no-go condition required for maneuver planning. This Project also matures and demonstrates methodologies to assign maneuver relevant engineering attributes to geospatial feature data such as bridge load classification, road condition, and bathymetry.

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

Research in this Project conducted at United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AR9 (Persistent Geophysical Sensing-Infrasound Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Remote Assessment of Infrastructure for Ensured Maneuver (RAFTER) Demonstrations	4.600	-	-
Description: This effort matures and demonstrates a light-weight, low-power, persistent monitoring system that is capable of integration with mission command platforms with associated software for processing geophysical data in near-real-time to provide actionable intelligence concerning critical transportation assets.			
Title: Battlefield Intelligence by Geophysical Sensing (BIGS) Demonstration	-	2.359	-
Description: This effort matures and demonstrates geophysical and geo-sensing technologies to persistently assess battlefield elements to include infrastructure (algorithm refinements) and additional sources of interest, such as explosive and fires events and various threats. Optimization of the array sensors and geometry to improve array performance for new sources of interest while reducing logistics will also be matured and demonstrated. New detection and classification signal processing algorithms will be validated throughout the life of the task in a phased demonstration schedule.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AS9 / Persistent Geophysical Sensing-Infrasound Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans: Mature and validate non-high performance computing meteorological and terrain/topography overlays for detection thresholds through internal demonstrations before integrating with existing software and will provide configuration updates to Integrated Sensor Architecture (ISA) messaging within the existing software to be compatible with Command Post Computing Environment (CPCE).</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 this effort is realigned to PE 0603042A (C3I Advanced Technology) Project CX8 (Persistent Geophysical Sensing-Infrasound Adv Tech).</p>				
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.089	-
Accomplishments/Planned Programs Subtotals		4.600	2.448	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AT3 / Subterranean Detection and Monitoring Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AT3: Subterranean Detection and Monitoring Adv Tech	-	3.360	2.217	-	-	-	-	-	-	-	0.000	5.577
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603042A (C3I Advanced Technology) Project CZ5 (Subterranean Detection and Monitoring Advanced Tech).

A. Mission Description and Budget Item Justification

This Project validates and demonstrates advanced subterranean monitoring and vulnerability assessment technologies providing mobile and man-portable solutions to enhance survivability and threat awareness during urban operations and negate enemy subterranean operation advantage. This Project also optimizes and demonstrates enhanced technologies to detect tunnels and tunneling activity in complex and varied environments.

This Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AT2 (Subterranean Detection and Monitoring Technology).

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

Research in this Project conducted at the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Subterranean Threat Assessment by Real-time Sensing Demonstrations	3.360	2.136	-
Description: This effort validates and demonstrates integrated suite of tunnel detection and persistent surveillance technologies, mobile and man-portable solutions to detect underground municipal infrastructure, voids, and other subterranean vulnerabilities in urban and complex domains.			
FY 2022 Plans: Demonstrate an integrated suite of tunnel detection and persistent surveillance technologies to detect subterranean avenues of approach in an operationally relevant urban environment.			
FY 2022 to FY 2023 Increase/Decrease Statement: The effort ends in Fiscal Year 2022 with scheduled demonstration at Maneuver Support, Sustainment and Protection Integration Experiments (MSSPIX).			
Title: FY 2022 SBIR/STTR Transfer	-	0.081	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AT3 / Subterranean Detection and Monitoring Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		3.360	2.217	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AT8 / Network-Enabled GeoSpatial-GEOINT Services AdvTech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AT8: Network-Enabled GeoSpatial-GEOINT Services AdvTech	-	2.888	3.059	4.603	-	4.603	4.739	4.178	5.416	8.013	0.000	32.896
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project accelerates and exploits the tactical value of emerging field generated, mission relevant 3-dimensional (3D) geospatial data supporting mission planning, mission rehearsal and tactical situational awareness. Integrates and demonstrates the geo-registration, feature extraction, change detection, data visualization and transmission capabilities developed in the applied research portion of this Project. Tools developed for the exploitation of 3D datasets will be integrated into a streamlined workflow requiring low levels of expertise, putting advanced processing capabilities in the hands of the Soldier. This Project also includes demonstrations of tactical enhancements and the integrated ability to rapidly share mission critical 3D information in support of planning and execution.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AT7 (Network-Enabled GeoSpatial and GEOINT Services Tech).

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: 3D Terrain Automated Geospatial Co-Registration and Change Detection	2.888	2.947	2.764
Description: This effort matures, integrates and demonstrates the design and formulation of new urban terrain data models, frameworks and processes to automate the transformation of tactical unit generated source data (e.g. Light Detection and Ranging (LiDAR), imagery, and full motion video derived data) to new model constructs for rapid and accurate geo-registration of features (manmade infrastructure).			
FY 2022 Plans: Mature, integrate and test digital elevation model co-registration and change detection algorithms providing tactical units rapid access to newly collected 3D terrain data. Demonstrate the optimization of algorithms for near real time processing, advanced analytics, and 3D data dissemination in a laboratory environment utilizing the Army Geospatial Enterprise Node.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AT8 / Network-Enabled GeoSpatial-GEOINT Services AdvTech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate advanced change detection algorithms achieving on average less than 10% of errors in matching varied data sources to achieve standard and shareable geospatial foundation data. Will demonstrate 2.5D and 3D data co-registration software in a relevant implementation environment for real-time processing, analytics, dissemination of tactical field collections to archived 3D geospatial data.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects the final year of Technical Readiness Level (TRL) 6 demonstration supporting insertion to Program Manager Intelligence Systems and Analytics.</p>				
<p>Title: Optimization of Geospatial Data for Tactical Visualization-Demonstration</p> <p>Description: This effort matures and demonstrates new open source software, data models and processes to generate a vision based geospatial foundation layer to enable end-users systems to visualize real-time mission critical geospatial content at the required level-of-detail (LOD) and enable position-navigation self-localization capability applicable to end-user devices at required accuracies optimized for the device, application, and mission.</p> <p>FY 2023 Plans: Will mature and demonstrate delivery of optimized 3D geospatial data for visualization on end-user-devices. Will demonstrate Position Navigation (PN) solutions extracted from field generated sources and delivered on to handheld devices through auto-generation of Level-of-Detail (LOD) 3D data.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding for this effort is realigned from PE 0603463A (Network C3I Advanced Technology) / Project AU2 (Optimization of Geospatial Data for Visualization).</p>		-	-	1.839
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.112	-
Accomplishments/Planned Programs Subtotals		2.888	3.059	4.603
C. Other Program Funding Summary (\$ in Millions)				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AT8 / Network-Enabled GeoSpatial-GEOINT Services AdvTech

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

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AU1 / Tactical GeoSpatial Information Capabilities ATech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AU1: <i>Tactical GeoSpatial Information Capabilities ATech</i>	-	3.603	4.207	5.996	-	5.996	2.103	2.702	2.797	5.717	0.000	27.125
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates next generation geospatial analytical tools for three-dimensional (3D) complex environments applicable to low echelon and tactical edge exploitation. These new capabilities will allow deployed units to enhance/update provisioned (baseline) standard, sharable, geospatial foundation (SSGF) data through automated analytics on multi-sourced spatial data resulting in streamlined, high fidelity terrain analysis products. Reducing data gaps and processing timelines will greatly increase Soldier situational awareness and support faster decision making in complex terrain.

Work in this Project complements PE 0602146A Network C3I Technology Project AT9 (Tactical GeoSpatial Information Capabilities Techn).

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

Research in this Project is performed by the Unites States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: 3D Terrain Analysis	3.064	2.148	3.902
Description: This effort integrates and demonstrates software models and workflows provisioned on the geospatial and GEOINT workstations for improved capabilities to generate, process and exploit terrain products enabling situational awareness and rapid decision making at the tactical edge.			
FY 2022 Plans: Demonstrate advanced terrain data processing capabilities, followed by toolkit testing and delivery, targeted for the Distributed Common Ground System (DCGS-A). Test automated feature extraction and faster processing times for higher-resolution data sources. Demonstrate enhanced terrain processing tools providing highly accurate, tactical scale decision aids supporting situational awareness, actionable maneuver and force protection in complex terrain through an enhanced geospatial feature layer of combined dense terrain and external image sources.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AU1 / Tactical GeoSpatial Information Capabilities ATech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate mature enhanced terrain processing and feature layer generation tools for Program Manager (PM) Intelligence Systems and Analytics (IS&A) (formerly DCGS-A), providing high resolution, highly accurate feature information to support situational awareness, actionable maneuver and force protection in highly dynamic operational environments.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase supports final year of Technical Readiness Level (TRL) 6 demonstration supporting insertion to PM IS&A.</p> <p>Title: Previously Advanced Airborne Light Detection and Ranging (LIDAR)</p> <p>Description: This effort integrates and demonstrates enhanced Geiger-mode LiDAR hardware/software, for advanced testing of protocols, equipment, and products for enhanced high-altitude/wide area terrain data collection, to support tactical operations.</p> <p>FY 2022 Plans: Mature new airborne LIDAR sensors signal processing algorithms to increase collection speed and enhance terrain feature collection accuracy providing evolutionary improvements to airborne collection of enhanced 3D urban data with expanded area coverage and decreased workflow timelines.</p> <p>FY 2023 Plans: Will demonstrate integrated system of hardware components with system-specific calibration and optimized signal processing to inform system requirements enabling long-standoff airborne 3D remote sensing.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase supports final year of TRL6 demonstration.</p>		0.539	1.905	2.094
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.154	-
Accomplishments/Planned Programs Subtotals		3.603	4.207	5.996
C. Other Program Funding Summary (\$ in Millions)				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) AU1 / <i>Tactical GeoSpatial Information Capabilities ATech</i>

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

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AU2 / Optimization of Geospatial Data for Visualization			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AU2: Optimization of Geospatial Data for Visualization	-	2.022	2.171	-	-	-	-	-	-	-	0.000	4.193
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603463A (Network C3I Advanced Technology) Project AT8 (Network-Enabled GeoSpatial-GEOINT Services AdvTech).

A. Mission Description and Budget Item Justification

This Project develops and demonstrates new open source software defined data models, and establishes an architecture to provide correct (mission context) geospatial content to the end-user consistent with device, tactical assessment/need, available bandwidth, and user movement. Advanced software and processes will reduce file size and network requirements, enabling near real-time updates to Soldiers. Resulting three-dimension 3D foundation data and associated accuracy information will enable position and navigation determination, through analysis with a variety of Soldier and vehicle borne sensors.

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Optimization of Geospatial Data for Tactical Visualization-Demonstration	2.022	2.092	-
Description: This effort matures and demonstrates new open source software, data models and processes to generate a vision-based geospatial foundation layer to enable end-users systems to visualize real-time mission critical geospatial content at the required level-of-detail (LOD) and enable position-navigation self-localization capability applicable to end-user devices at required accuracies optimized for the device, application, and mission.			
FY 2022 Plans: Demonstrate push of tactically relevant geospatial intelligence (GEOINT) to mobile devices, with consideration paid to factors determining level of detail and new 3D data representation selected to minimize bandwidth.			
FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year 2023 this Project is realigned to PE 0603463A (Network C3I Advanced Technology) Project AT8 (Network-Enabled GeoSpatial-GEOINT Services Adv Tech).			
Title: FY 2022 SBIR/STTR Transfer	-	0.079	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AU2 / Optimization of Geospatial Data for Visualization		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		2.022	2.171	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AU4 / Geospatially Enabled Operational Design Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AU4: <i>Geospatially Enabled Operational Design Adv Tech</i>	-	7.905	7.956	12.197	-	12.197	10.905	10.731	5.090	5.089	0.000	59.873
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates, integrates and transitions to the Army Command Post Computing Environment, a geospatially enabled collaborative planning environment, accessible across echelons, with capabilities that support Army Design Methodology (ADM) by providing the ability to perform conceptual planning and problem framing, supporting a greater understanding and visualization of the dynamic operational environment, a shared understanding of the operations purpose across echelons, and enhanced products to drive detailed budget planning and operational assessment processes, enhancing the collaborative interaction between commanders, staffs, and unified action partners.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AU3 (Geospatially Enabled Operational Design Technology).

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Geospatially Operational Design (GEOD) - Demonstration	7.905	7.665	5.081
Description: This effort integrates and demonstrates automation technologies to digitally visualize, create and assess critical elements of the Operational Environment required to inform the Operational Design functions, including collaborative conceptual framing of the problem.			
FY 2022 Plans: Demonstrate tools to support Army Design Methodology (ADM) to frame the problem and visualize the desired end state in a geospatial context. Evaluate a suite of data visualization capabilities that allow commanders and staffs to bridge conceptual planning to deliberate planning at echelons down to battalion.			
FY 2023 Plans: Will demonstrate and transition a set of advanced strategic and operational planning tools to support ADM, and digitally create, visualize, assess, and brief the design framework, critical elements, and their interrelationships inside the Operational			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AU4 / Geospatially Enabled Operational Design Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Environment in geospatial and geopolitical context. Will be transitioned to the Command Post Computing Environment (CPCE) Program of Record. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease as a result of the final year of Technical Readiness Level (TRL) 6 demonstration and transition to Program Manager Mission Command.				
Title: Integration of intel and logistics Multi Echelon Planning Description: This effort demonstrates a suite of analytical and visualization tools designed to facilitate analysis of multiple courses of action through modeling and simulation (M&S) and wargames to support development of alternate Courses of Action (COAs) and approval of the operational plan. FY 2023 Plans: Will integrate and demonstrate an advanced suite of automated tools to facilitate development of COAs, to include initial assessments of their viability and set up of wargames and M&S that support further analysis. FY 2022 to FY 2023 Increase/Decrease Statement: Funding for this effort is realigned from PE 0603463A (Network C3I Advanced Technology) / Project AV1 (GEOInt/Ops Logistics Integration-Planning Adv Tech).		-	-	4.038
Title: Automated intelligence Preparation of the Battlefield (IPB) Demonstrations Description: This effort develops and demonstrates a collaborative, adaptive planning capability that allows planners to employ resources leveraging geospatial, terrain, environmental effects, and authoritative data from distributed information databases in order to collaborate in the development and assessment of courses of action, visualize potential outcomes, make decisions and develop and disseminate plans and orders. FY 2023 Plans: Will develop and demonstrate advanced capabilities for multi-domain visualization of IPB products, and automates integration of those products into the military planning process. FY 2022 to FY 2023 Increase/Decrease Statement: Funding for this effort is realigned from PE 0603463A (Network C3I Advanced Technology) / Project CF9 (Automated IPB Demonstrations).		-	-	3.078
Title: FY 2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638		-	0.291	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AU4 / Geospatially Enabled Operational Design Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	7.905	7.956	12.197

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

Remarks
N/A

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AV1 / GEOInt/Ops Logistics Integration-Planning Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AV1: GEOInt/Ops Logistics Integration-Planning Adv Tech	-	3.771	3.867	-	-	-	-	-	-	-	0.000	7.638
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603463A (Network C3I Advanced Technology) Project AU4 (Geospatially Enabled Operational Design Adv Tech).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a suite of analytical and visualization tools designed to facilitate analysis of courses of action (COAs) through modeling and simulation (M&S) and wargames to support development of alternate COAs and approval of the operational plan (OPLAN). This Project will integrate existing M&S and wargaming applications (One Semi-Automated Forces; Infantry Warrior Simulation ; Logistics Composite Model), to assess multiple courses of action to be analyzed in a multi-domain environment.

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Integration of intel and logistics Multi Echelon Planning	3.771	3.726	-
Description: This effort demonstrates a suite of analytical and visualization tools designed to facilitate analysis of multiple courses of action through M&S and wargames to support development of alternate COAs and approval of the operational plan.			
FY 2022 Plans: Demonstrate automated analysis and synchronization of multiple courses of action with M&S and war-games, streamlining the COA comparison and approval processes, and ultimately the operational plan approval.			
FY 2022 to FY 2023 Increase/Decrease Statement: In FY23 funding for this effort is realigned to PE 0603463A (Network C3I Advanced Technology) Project AU4 (Geospatially Enabled Operational Design Adv Tech).			
Title: FY 2022 SBIR/STTR Transfer	-	0.141	-
Description: Funding transferred in accordance with Title 15 USC ?638			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AV1 / GEOInt/Ops Logistics Integration-Planning Adv Tech
--	---	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	3.771	3.867	-

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

Remarks
N/A

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AV2 / LEO Advanced Technology
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AV2: LEO Advanced Technology	-	1.949	-	-	-	-	-	-	-	-	0.000	1.949
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures Low Earth Orbit (LEO) constellation management for space order-of-battle architectures and protocols. The advanced technology development will involve using two spacecraft and will leverage commercial LEO mega-constellation investments to develop capabilities, which support direct sensor-to-shooter data links while under control by a maneuver battalion commander. Technology will be optimized to enable communications and deep strikes in contested environments. This Project supports the Army's efforts to proliferate and control space assets to support the tactical ground commander. It includes exploration efforts to augment missile warning, Global Positioning System (GPS), and global communications.

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

Research in this Project is performed by the United States (US) Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) Technical Center in Huntsville, AL and the Defense Advanced Research Projects Agency (DARPA), Arlington, VA.

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

	FY 2021	FY 2022	FY 2023
Title: Payload Technology Development	1.949	-	-
Description: Mature the technology for Low Earth Orbit satellites. Payload integration will be validated as well as the architecture and design of two LEO satellites for support to an Army tactical commander.			
Accomplishments/Planned Programs Subtotals	1.949	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AV4 / Foundational S&T for Network C3I Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AV4: Foundational S&T for Network C3I Advanced Tech	-	2.068	7.751	0.896	-	0.896	0.043	2.268	12.409	16.282	0.000	41.717
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates underlying technologies applicable to artificial intelligent agents and holistic network integration as applied to, but not limited to autonomous manned-unmanned teaming for ground and air platforms. This Project also matures and demonstrates emerging research leading to potential technology development in areas of strategic importance to the Army in network technologies, by bringing competitively selected Universities with research teams into Technical Alliances.

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

Research in this Project is performed by the Army Futures Command (AFC).

This Research in this Project is done in coordination with (Program Element (PE) 0602146A (Network C3I Technology) / Project AV3 (Foundational S&T for Network C3I Technology).

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

	FY 2021	FY 2022	FY 2023
Title: Demonstration of emerging technologies for holistic network integration	2.068	-	-
Description: This effort matures and demonstrates underlying technologies applicable to next generation networks and integration of the same.			
Title: Demonstration of Disruptive, Innovative Research for Emerging (DIRE) Advanced Network Capabilities	-	7.468	0.896
Description: This effort demonstrates innovative network capabilities using a rapid and agile methodology to evaluate the feasibility of incorporation into Army network problem sets.			
FY 2022 Plans: Will demonstrate and evaluate innovative emerging technologies focusing on network resiliency, artificial intelligence, and autonomy enabled machine learning technologies that will be integrated into a holistic network in support a multi-domain operations (MDO) enabled environment.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AV4 / Foundational S&T for Network C3I Advanced Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Completing innovative technology pilot for experimenting and demonstrating innovative and disruptive network capabilities in the space of network resiliency, artificial intelligence, and autonomy. FY 2022 to FY 2023 Increase/Decrease Statement: Decrease in funding due to fewer requirements needed to complete identified efforts during the Fiscal Year 2022 (FY22) search process.				
Title: SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.283	-
Accomplishments/Planned Programs Subtotals		2.068	7.751	0.896
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) AV8 / Navigation Warfare (NAVWAR) Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AV8: Navigation Warfare (NAVWAR) Advanced Technology	-	2.535	1.927	1.949	-	1.949	6.002	3.958	5.985	-	0.000	22.356
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates capabilities allowing the Army to monitor, understand, and control the Navigation Warfare (NAVWAR) environment. This requires an integrated approach to Electronic Protection (EP), Electronic Support (ES), and Electronic Attack (EA) to rapidly characterize the NAVWAR environment, deny Positioning, Navigation, and Timing (PNT) based capabilities to our adversaries, and maintain Army capabilities.

Research accomplished under Program Element (PE) 0602146A (Network C3I Technology) / Project AW1 (Autonomous Navigation Technology) complements this Project.

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: PNT Situational Awareness (SA) Advanced Technology	2.535	1.856	1.949
Description: This effort demonstrates real time PNT Situational Awareness for a Common Operating Picture (COP) on selected Computing Environment (CE); improves fusion algorithms for at least two types of PNT SA sensors (terrestrial, air, space); generates an Interface Control Document (ICD) for PNT SA messages; allow open integration and reference implementation for PNT SA stored data for distribution on various platforms.			
FY 2022 Plans: Will incorporate high altitude sensor data to take advantage of the unique performance characteristics of existing sensors in different domains. Improve existing PNT SA ICD to make use of multidimensional data fields.			
FY 2023 Plans: Will mature and validate integration of aerial sensor data into data fusion software and will demonstrate an integrated system of systems approach at a field demonstration.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AV8 / Navigation Warfare (NAVWAR) Advanced Technology
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding change reflects planned lifecycle for this effort.			
Title: FY2022 SBIR/STTR Transfer	-	0.071	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	2.535	1.927	1.949

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AW4 / DoD PNT M&S Collaborative Initiative (CI) Adv Tech
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AW4: DoD PNT M&S Collaborative Initiative (CI) Adv Tech	-	2.888	-	-	-	-	-	-	-	-	0.000	2.888
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures, demonstrates and performs modeling and simulation (M&S) of Positioning, Navigation, and Timing (PNT) technologies to provide access to trusted PNT information in global positioning system (GPS) denied or degraded environments.

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project AW3 (DoD PNT M&S Collaborative Initiative (CI) Technolo).

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

Research in this Project is performed by the Unites States (U.S.) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: DoD PNT M&S Collaborative Initiative (CI)	2.888	-	-
Description: This effort matures, demonstrates and performs M&S of PNT technologies to provide access to trusted PNT information in GPS denied or degraded environments.			
Accomplishments/Planned Programs Subtotals	2.888	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AW6 / Modular GPS Independent Sensors Advanced Tech
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AW6: Modular GPS Independent Sensors Advanced Tech</i>	-	10.684	6.791	10.131	-	10.131	12.289	16.702	14.629	20.609	0.000	91.835
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a resilient, soldier-integrated precision navigation and timing solution, providing precision geolocation, geospatial survey information, global positioning system (GPS) spoofing awareness and countermeasures to dismounted warfighters in GPS-denied/degraded environments.

Research accomplished under Program Element (PE) 0602146A (Network C3I Technology) complements this Project.

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Soldier-Integrated Positioning, Navigation, and Timing (PNT)	10.684	6.542	2.476
Description: This effort implements a standards-based, open PNT architecture solution for rapid commercial of the shelf (COTS) and emerging technology integration; incorporates artificial intelligence approaches to aggregate multiple organic and networked sensor inputs for improved PNT accuracy and reliability; demonstrates Simultaneous Localization and Mapping (SLAM) based-algorithms incorporating alternative PNT inputs; and demonstrates alternative PNT sensors and approaches, including radio frequency time differencing, signals of opportunity, inertial, gravimetric, and imagery.			
FY 2022 Plans: Will continue to validate, and integrate, initial Soldier-Integrated PNT technologies through technology discovery with Army Applications Lab and maturation of commercial systems. Will mature PNT interfaces and messaging necessary to distribute accurate position and timing across wirelessly-connected soldier-borne component. Will improve the performance of vision aided navigation utilizing artificial intelligence techniques and assess existing spoof-detection algorithms for integration. Will optimize size, weight, and power (SWAP) of anti-jam antennas for dismounted users. Will integrate and demonstrate interoperability of modular, alternative PNT sensors with existing Army dismounted PNT systems.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) AW6 / Modular GPS Independent Sensors Advanced Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will exploit and provide technology discovery for network ranging, flexible and modular Radio Frequency (RF) antenna designs. Will execute demonstrations and soldier touch points with anti-jam technologies. Will finalize fabrication and packaging.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: A portion of funding is realigned to support task Soldier Integrated Positioning Navigation and Timing - Modular Architecture & Integrated Demonstrators</p>				
<p>Title: Soldier Integrated Positioning Navigation and Timing - Modular Architecture & Integrated Demonstrators</p> <p>Description: This effort optimizes, improves, and demonstrates the modular architecture for PNT capabilities; matures and integrates alternative PNT sensors and approaches, including radio frequency time differencing, signals of opportunity, inertial, gravimetric, and imagery; matures, integrates, demonstrates and validates a final Modular Handheld; integrates and demonstrates PNT technologies with Soldier interface systems.</p> <p>FY 2023 Plans: Will optimize and validate the Initial Modular Handheld and PNT technologies, including the PNT open architecture; optimize and validate sensor integration for new PNT algorithms, anti-jam capability, vision aided navigation, network ranging and other alternate navigation technologies. Fabricate and demonstrate PNT open architecture, PNT technologies and validated sensors in SWAP optimized integrated demonstrator. Execute soldier touch points with the integrated demonstrator.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from task Soldier-Integrated PNT to provide greater visibility of this ongoing effort</p>		-	-	7.655
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.249	-
Accomplishments/Planned Programs Subtotals		10.684	6.791	10.131
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) AW6 / <i>Modular GPS Independent Sensors Advanced Tech</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology			Project (Number/Name) BP4 / ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BP4: ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)	-	64.800	55.500	-	-	-	-	-	-	-	0.000	120.300
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional Interest Item funding provided for Electronic Warfare Advanced Technologies.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Electronic Warfare Advanced Technologies.

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 2021	FY 2022
Congressional Add: Assured Position, Navigation, and Timing Technology	6.300	4.000
FY 2021 Accomplishments: Conducted advanced research in Assured Position, Navigation, and Timing Technology. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for APNT Technology		
Congressional Add: Army Visual and Tactical Arctic Reconnaissance	2.000	-
FY 2021 Accomplishments: Conduct advanced research in Army Visual and Tactical Arctic Reconnaissance. Work executed by Army Futures Command.		
Congressional Add: Program increase - anticipating threats to natural systems	6.000	-
FY 2021 Accomplishments: Conduct advanced research in Anticipating Threats to Natural Systems. Work executed by Army Futures Command.		
Congressional Add: Program Increase - S?UAS cyber threat management	7.500	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) BP4 / ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
FY 2021 Accomplishments: Conduct advanced research in S-UAS Cyber Threat Management. Work executed by Army Futures Command.		
Congressional Add: Program Increase - Sub-Surface Infrastructure in Arctic Environments FY 2021 Accomplishments: Conduct advanced research in Sub-Surface Infrastructure in Arctic Environments. Work executed by Army Futures Command.	1.000	-
Congressional Add: Program Increase - Mesh Network-Enabled Small Satellites FY 2021 Accomplishments: Conduct advanced research in Mesh Network-Enabled Small Satellites. Work executed by Army Futures Command.	10.000	-
Congressional Add: Program Increase - Geospatial Artificial Intelligence Analytic Tools FY 2021 Accomplishments: Conduct advanced research in Geospatial Artificial Intelligence Analytical Tools. Work executed by Army Futures Command.	4.000	-
Congressional Add: Program Increase - Advanced Materials and Technologies for Command Post Modernization FY 2021 Accomplishments: Conducted advanced research in Advanced Materials and Technologies for Command Post Modernization. Work executed by Army Futures Command.	10.000	-
Congressional Add: Program Increase - Advanced Materials for Resilient Sensors FY 2021 Accomplishments: Conduct advanced research in Advanced Materials for Resilient Sensors. Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for Advanced Materials for Resilient Sensors	8.000	5.000
Congressional Add: Program Increase - Tactical Geospatial Information Capabilities FY 2021 Accomplishments: Conduct advanced research in Tactical Geospatial Information Capabilities.	10.000	5.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) BP4 / ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Tactical Geospatial Information Capabilities		
Congressional Add: Alternative Navigation for GPS-Denied Landing Environments	-	4.500
FY 2022 Plans: Congressional Interest Item funding provided for Alternative Navigation for GPS-Denied Landing Environments		
Congressional Add: Edge-High Performance Computing for Multi-Domain Operations	-	5.000
FY 2022 Plans: Congressional Interest Item funding provided for Edge-High Performance Computing for Multi-Domain Operations		
Congressional Add: HALITE	-	7.000
FY 2022 Plans: Congressional Interest Item funding provided for HALITE		
Congressional Add: Next Generation Command Posts	-	10.000
FY 2022 Plans: Congressional Interest Item funding provided for Next Generation Command Posts		
Congressional Add: Receiver-Sensor Technology for Tactical Networks	-	15.000
FY 2022 Plans: Congressional Interest Item funding provided for Receiver-Sensor Technology for Tactical Networks		
Congressional Adds Subtotals	64.800	55.500

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

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) CF9 / Automated IPB Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CF9: Automated IPB Adv Tech	-	-	0.989	-	-	-	-	-	-	-	0.000	0.989
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to Program Element (PE) 0603463A (Network C3I Advanced Technology) Project AU4 (Geospatially Enabled Operational Design Adv Tech).

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate advanced algorithms for multi-domain visualization of explicit and implicit relationships between the populace and the theater environment. Capabilities resulting from this effort will directly and substantially support Army and Joint Global Integration Planning requirements, provide a globally accessible web based digital intelligence preparation of the battlefield (IPB) platform supporting collaborative product development, and help facilitate a shared understanding of the operational environment. Automated IPB provides an integrated Intelligence Community planning data platform for Joint Global Integration Planning requirements.

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

Research in this Project is performed by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Automated IPB Demonstrations	-	0.953	-
Description: This effort develops and demonstrates a collaborative, adaptive planning capability that allows planners to employ resources leveraging geospatial, terrain, environmental effects, and authoritative data from distributed information databases in order to collaborate in the development and assessment of courses of action, visualize potential outcomes, make decisions and develop and disseminate plans and orders.			
FY 2022 Plans: Design and demonstrate algorithms for advanced, multi-domain visualization of explicit and implicit relationships between the populace and the theater environment.			
FY 2022 to FY 2023 Increase/Decrease Statement: In Fiscal Year 2023 (FY23), this effort is realigned to PE0603463A (Network C3I Advanced Technology) Project AU4 (Geospatially Enabled Operational Design Adv Tech).			
Title: FY 2022 SBIR/STTR Transfer	-	0.036	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) CF9 / Automated IPB Adv Tech

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	0.989	-

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology				Project (Number/Name) C17 / Mobile & Survivable Command Post (MASCP) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
C17: Mobile & Survivable Command Post (MASCP) Adv Tech	-	-	7.809	13.119	-	13.119	18.609	16.332	19.729	19.724	0.000	95.322
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Project matures and demonstrates technologies to support scalable, survivable, mobile Command Posts (CP). Technologies addressed will use the Brigade CP as a baseline while providing the opportunity for solutions to scale up or down to Army tactical echelons. Research in this Project includes integrating anti-jam (AJ) and low probability of intercept (LPI)/low probability of detection (LPD) communications focused on enabling the CP to disperse, form & reform, and employ technologies for signal remoting; optimizing power generation and storage for distributed CP operations; reducing computing infrastructure footprint, size, weight, and power (SWAP), manpower, and complexity; maturing technologies to reduce CP emissions and have situational awareness of those signatures to improve CP node employment; maturing electro-magnetic spectrum (EMS) emulation technologies to improve survivability options; and optimizing emerging electronic-textiles and composite materials for CP structures.

Work in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Project C13 (Mobile and Survivable Command Post (MASCP) Tech).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: CP Modularity and Dispersion Advanced Technology	-	3.350	2.387
Description: Increases the ability for Commanders to move and disperse the CP through improved intra-CP communications, modular CP hardware to include distributed power systems, and network solutions leveraging open systems architectures to support information flow in distributed, intermittent, and latent (DIL) environments. This effort will eliminate centralized points of failure and critical nodes that constrain CP mobility and survivability. Areas of technology development include be distributed tactical cloud architecture, mesh network security architecture, high performance computing, integrated power, and distributed collaborative technologies.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) C17 / Mobile & Survivable Command Post (MASCP) Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will optimize subsystems of a wireless antenna remoting capability based on the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Electronic Warfare (EW) Open Suite of Standards (CMOSS); improve the performance of highly directional transport using wireless antenna remoting with AJ and LPD to send and receive information between a command node and the remote site; optimize component design of small power generation, storage technology, and onboard vehicle power technologies to enable distributed command post operations; validate and optimize hardware and software components to support distributed CP computing.</p> <p>FY 2023 Plans: Will begin demonstrations of a wireless antenna remoting capability and Command Post specific communications systems that are effective with Dispersed Command Post configurations; will demonstrate initial capabilities for dispersed collaboration; will mature the vehicle mounted power systems using open standard interfaces to accurately measure and respond to changing power demands of dispersed command post operations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease in Fiscal Year 2023 (FY23) funding due to significant reduction in scope of wireless antenna remoting capabilities.</p>				
<p>Title: Signature Management and Reduction Advanced Technology</p> <p>Description: Provides advanced technologies to reduce and manage electromagnetic spectrum signatures of CP platforms and command post components.</p> <p>FY 2022 Plans: Will mature a sensor-based radio frequency (RF) awareness tool that will allow friendly Commanders to see and understand their emission posture; validate the performance of sensors to detect RF emissions; optimize and demonstrate a software application providing situational awareness of CP emission status.</p> <p>FY 2023 Plans: Will demonstrate initial proof-of-concept hardware and software to provide real time situational awareness of Command Post radio frequency emissions; will demonstrate solutions to decrease CP signature in ultraviolet, visible, thermal, infrared, radar, and radio frequency spectra.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase in FY23 due to increased scope for the development of CP centric sensors; demonstrating RF signal detection algorithms and building additional user interface s/w for CP signature solutions.</p>		-	0.392	6.853
<p>Title: Advanced Technology Supporting Camouflage, Concealment, and Deception</p>		-	3.782	3.879

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) C17 / Mobile & Survivable Command Post (MASCP) Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: This effort demonstrates innovative camouflage, concealment and deception technologies, for expeditionary assets (i.e. mission command platforms, battle management centers and supporting equipment), in order to defeat advanced and emerging adversary Intelligence, Surveillance and Reconnaissance (ISR) threats, and to reduce the probability of detection in multi-domain operations. Matures physics-based models for material and system performance that support probability of detection metrics in the multi-domain operational environment.</p> <p>FY 2022 Plans: Will demonstrate the ability to provide electromagnetic shielding for complexed shelters, while maintaining radio frequency shielding performance, large format advanced camouflage solutions, and demonstrator physical asset with signatures; mature inflatable technologies and protection material solutions and demonstrate these capabilities in support of rapidly deployable CPs; mature and integrate mobile camouflage capabilities to mitigate CP vulnerability; mature and demonstrate use of EMS emulations on autonomous systems.</p> <p>FY 2023 Plans: Will validate and verify ability to address signature management performance in a relevant environment; will demonstrate deployable command post solutions on targeted mobile platforms; will perform analysis of sensor demonstration data to inform command post situational awareness; will demonstrate increased survivability for multi-domain operations.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.285	-
Accomplishments/Planned Programs Subtotals		-	7.809	13.119
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) C17 / <i>Mobile & Survivable Command Post (MASCP) Adv Tech</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology					Project (Number/Name) CJ8 / Assured PNT Communications Advanced Tech		
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CJ8: Assured PNT Communications Advanced Tech	-	-	16.438	11.128	-	11.128	11.640	13.208	13.830	13.903	0.000	80.147
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will provide prototyping, development, and experimentation of High Altitude (HA) sensors and Tactical Space Layer (TSL) sensors (electro-optical, synthetic aperture radar (SAR), and radio frequency) which are designed to provide wide-area, responsive deep area sensing required for beyond line of sight (BLOS) targeting and force maneuver, significantly reducing Sensor to Shooter (S2S) timelines. This Project matures, demonstrates, and integrates lightweight materials, hardware components with reduced power consumption, and advanced data collection, processing, and dissemination capabilities. This Project also improves algorithms that process space and near space sensor data in real and near real time for integration into battlefield operating systems.

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

Research in this Project is performed by the United States Army Space and Missile Defense Command (USASMDC) Technical Center (TC).

Research in this Project complements Program Element (PE) 0602146A (Network C3I Technology) / Projects CK1 (Assured PNT Enabling Technologies) and Project CG3 (Assured PNT Communications Applied Research).

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

	FY 2021	FY 2022	FY 2023
Title: Assured Positioning Navigation and Timing (APNT) Communications Advanced Technology	-	16.036	11.128
Description: This effort matures and demonstrates technologies required for smaller, more responsive and direct access to space and HA deep-sensing sensors and tactical communication capabilities for soldiers at the tactical edge. Research will augment, improve, exploit, and optimize existing commercial and Department of Defense (DoD) technologies and networks.			
This effort will validate software, hardware, and algorithms used to enable Space-Based and HA platform based capabilities in support of the Army's Modernization Priorities. This effort will exploit commercial advances and opportunities in integrating Space/HA sensors or Deep Sensing capabilities and payload management toward future Army concepts. Develop/demonstrate critical technical elements for a LEO-based global high-speed network backbone enabling highly networked, resilient, and persistent DoD payloads to provide over the horizon sensing, signals, and communication, with continuous surveillance of ground, surface, and air domains.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / <i>Network C3I Advanced Technology</i>	Project (Number/Name) CJ8 / <i>Assured PNT Communications Advanced Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Will demonstrate systems during joint exercises; demonstrate a sensor designed to provide space-based situational awareness to the tactical Warfighter; develop and demonstrate small satellite capabilities, which include classified payloads, to provide APNT services to the tactical ground component Warfighters; exploit a constellation of space-based sensors that provide Tactical ISR (Intelligence, Surveillance, and Reconnaissance) and SA to the ground force commander to support multi-domain operations (MDO); develop and demonstrate optical communications for Quantum Entanglement (QE);develop and demonstrate QE including site-to-site communications from a small satellite in Space or High Altitude platform; and mature the QE technology and demonstrate optical and quantum signals passed between small spacecraft, HA platforms, and/or Space (or HA) to ground. Will complete assembly, integration, testing, and conduct a technology demonstration event; and participate in joint exercises, culminating with Technical Readiness Level (TRL) 5 payload technology demonstration in an operational environment.</p> <p>FY 2023 Plans: Will develop and demonstrate small satellite capabilities, which include classified payloads, to provide APNT services to the tactical ground component Warfighters; exploit a constellation of space-based sensors that provide Tactical ISR (Intelligence, Surveillance, and Reconnaissance) and Situational Awareness (SA) to the ground force commander to support MDO; develop and demonstrate optical communications using classical and Quantum Entanglement (QE) technologies; develop and demonstrate QE including site-to-site communications from a small satellite in Space, High Altitude platform, or ground based/launched platform; and mature the QE technology and demonstrate optical and quantum signals passed between small spacecraft, HA platforms, Space (or HA), and/or ground launched assets. Will complete assembly, integration, testing, and conduct a QE technology demonstration event tied to Army warfighter communications requirements. Will begin design and development of including long lead component orders of classified capabilities and high altitude platforms and associated payloads to support tactical ground component Warfighters with advanced APNT capabilities.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funds decrease reflect completion and transition of two products to Program Executive Officer (PEO) for Intelligence, Electronic Warfare and Sensor (PEO IEW&S) after demonstrations in Fiscal Year 2022 (FY22).</p>			
<p>Title: SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC 638.</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC 7638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 638.</p>	-	0.402	-
Accomplishments/Planned Programs Subtotals	-	16.438	11.128

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603463A / Network C3I Advanced Technology	Project (Number/Name) CJ8 / Assured PNT Communications Advanced Tech

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology
--	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	177.142	141.909	100.830	-	100.830	133.252	123.417	141.776	133.446	0.000	951.772
AE8: Land-Based Anti-Ship Missile (LBASM) Advanced Tech	-	9.690	15.698	12.150	-	12.150	-	-	-	-	0.000	37.538
AE9: Low-Cost Tact Ext Range Missile (LC-TERM) Adv Tech	-	9.710	-	-	-	-	-	-	-	-	0.000	9.710
AF2: Long Range Maneuverable Fires (LRMF) Advanced Tech	-	-	-	4.663	-	4.663	18.968	27.683	34.342	34.333	0.000	119.989
AG3: Extended Range Cannon Artillery (ERCA) Adv Tech	-	17.760	3.117	3.354	-	3.354	-	6.444	9.357	11.225	0.000	51.257
AG5: Extended Range Artillery Munition Suite Adv Tech	-	48.822	33.828	27.461	-	27.461	31.581	9.672	-	-	0.000	151.364
AG7: Energetic Materials and Adv Processing Adv Tech	-	2.061	2.096	1.954	-	1.954	-	-	-	-	0.000	6.111
BO8: Long Range Precision Fires Advanced Tech (CA)	-	60.000	48.000	-	-	-	-	-	-	-	0.000	108.000
BY2: Advanced Hypersonic Technology	-	29.099	39.170	36.517	-	36.517	63.854	49.315	74.637	74.617	0.000	367.209
CE9: Armaments Advanced Technology*	-	-	-	-	-	-	-	9.359	13.274	13.271	0.000	35.904
CZ8: PrSM Modular Payload Advanced Development	-	-	-	14.731	-	14.731	18.849	20.944	10.166	-	0.000	64.690

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates Long Range Precision Fires (LRPF) technologies to destroy, neutralize, or suppress the enemy by cannon artillery and missile fire and enable integration of fire support assets into combined arms operations. Major Focus Areas for LRPF Science and Technology include: Missiles, Cannon Artillery, and Supporting LRPF Technologies covering Strategic, Operational and Tactical Lines of Effort. LRPF Missiles Advanced Development matures and demonstrates a broad range of Missile technologies to enhance Army integrated LRPF capabilities at extended range. Cannon Artillery Advanced Development matures and demonstrates critical technologies to increase range, precision, and both point and area effects for cannon artillery. Supporting LRPF

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>
---	---

Technologies Advanced Development matures and demonstrates a broad range of component technologies to address weapon cost drivers and enhance performance of future LRPF munitions and systems.

Research in this Program Element (PE) complements PE 0602147A Long Range Precision Fires Technology.

This PE is directly aligned to the Army Long Range Precision Fires (LRPF) 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.

Research is performed by the United States Army Futures Command (AFC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	177.142	93.909	0.000	-	0.000
Current President's Budget	177.142	141.909	100.830	-	100.830
Total Adjustments	0.000	48.000	100.830	-	100.830
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	48.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	100.830	-	100.830

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

Project: BO8: *Long Range Precision Fires Advanced Tech (CA)*

Congressional Add: *Missile Rapid Demonstration Capability*

Congressional Add: *Program Increase - Composite Cannon Tubes*

Congressional Add: *Program Increase - Hypervelocity Projectile Extended Range*

Congressional Add: *Program Increase: Tactical Intercepting Vehicle for Access*

Congressional Add: *Extended Range Artillery Munitions Suite*

Congressional Add: *Maneuvering Submunitions for Precision Strike Missile*

Congressional Add Subtotals for Project: BO8

	FY 2021	FY 2022
	25.000	-
	5.000	-
	20.000	25.000
	10.000	-
	-	20.000
	-	3.000
Congressional Add Subtotals for Project: BO8	60.000	48.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>
---	---

Congressional Add Details (\$ in Millions, and Includes General Reductions)		FY 2021		FY 2022
	Congressional Add Totals for all Projects	60.000		48.000

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AE8 / Land-Based Anti-Ship Missile (LBASM) Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AE8: Land-Based Anti-Ship Missile (LBASM) Advanced Tech	-	9.690	15.698	12.150	-	12.150	-	-	-	-	0.000	37.538
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by maturing and demonstrating critical technologies to detect, engage, and defeat moving land or maritime surface targets under all conditions.

Research in this Project complements Program Element (PE) 0602147A (Long Range Precision Fires Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Land Based Anti-Ship Missile (LBASM) Advanced Technology	9.690	15.125	12.150
Description: Matures and demonstrates technologies that enable high-mobility artillery rocket system (HIMARS) and multiple-launch rocket system (MLRS) rocket/missile artillery systems to destroy enemy air defenses in the land and the maritime domains.			
FY 2022 Plans: Will complete demonstrations of multi-mode seeker technologies in a surrogate missile system to obtain real world effect on seeker performance; complete analysis flight testing data and optimization of tracking, identification and aim-point algorithms; and begin maturation and integration of seeker technologies into the Precision Strike Missile (PrSM).			
FY 2023 Plans: Will end demonstrations and data evaluation of multi-mode seeker technologies in a surrogate missile system. Will mature concepts for re-factoring multi-mode seeker technologies into PrSM form factor. Will demonstrate multi-mode seeker technologies as part of the PrSM form factor through hardware-in-the-loop to verify operation when integrated with other PrSM components.			
FY 2022 to FY 2023 Increase/Decrease Statement: Decrease in funding is due to completing development and fabrication of seeker components for flight testing on surrogate missile.			
Title: FY2022 SBIR/STTR Transfer	-	0.573	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>	Project (Number/Name) AE8 / <i>Land-Based Anti-Ship Missile (LBASM) Advanced Tech</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	9.690	15.698	12.150

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AE9 / Low-Cost Tact Ext Range Missile (LC- TERM) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AE9: Low-Cost Tact Ext Range Missile (LC-TERM) Adv Tech	-	9.710	-	-	-	-	-	-	-	-	0.000	9.710
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires (LRPF) Modernization Priority capabilities by maturing and demonstrating propulsion technologies that enables extended range target engagements and navigation component technologies that reduce dependence on Global Positioning System (GPS) for precision effects. Additionally, technology development will support LRPF capabilities by investigating and developing critical technologies for the delivery of dedicated organic intelligence, surveillance and reconnaissance (ISR) payloads and attack capabilities via long range missiles. These long range missile delivered payloads will provide ISR that will be able to provide targetable data for area and point targets, and attack platforms for targets of opportunity.

Research in this Project complements Program Element (PE) 0602147A (Long Range Precision Fires Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Low-Cost Tactical Extended Range Missile (LC-TERM) Advanced Technology	9.710	-	-
Description: Mature and demonstrate propulsion technologies that enables extended range target engagement and navigation component technologies that reduce dependence on GPS for precision.			
Accomplishments/Planned Programs Subtotals	9.710	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AF2 / Long Range Maneuverable Fires (LRMF) Advanced Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AF2: Long Range Maneuverable Fires (LRMF) Advanced Tech	-	-	-	4.663	-	4.663	18.968	27.683	34.342	34.333	0.000	119.989
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by developing, maturing and demonstrating next generation Multi-Domain Operations extended range weapon system technology for Precision Strike Missile to increase survivability, penetration, and range in complex Anti Access/Area Denial (A2/AD) and denied environments. This Project also includes both the maturation and demonstration of advanced extended range missile technology and autonomous, unmanned launcher technology. The combination of these technologies offers the potential to dramatically increase force projection through increases in range, firepower, and magazine depth.

Research in this Project complements Program Element (PE) 0602147A (Long Range Precision Fires Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Long Range Maneuverable Fires (LRMF) Advanced Tech	-	-	4.663
Description: Matures and demonstrates next generation Multi-Domain Operations extended range weapon system technology for Precision Strike Missile to increase survivability, penetration, and range in complex A2/AD and denied environments. Includes maturation and demonstration of advanced extended range missile technology and autonomous, unmanned launcher technology.			
FY 2023 Plans: Will develop and mature combined cycle extended range missile propulsion engine and autonomous unmanned launcher designs and perform critical sub-system assessments in preparation for system level integration.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from PE 0602147A (Long Range Precision Fires Technology) / Project AF1 (Long Range Maneuverable Fires (LRMF) Technology) to mature and demonstrate missile propulsion and unmanned launcher technologies in support of multi-domain operations through extended range fires.			
Accomplishments/Planned Programs Subtotals	-	-	4.663

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>	Project (Number/Name) AF2 / <i>Long Range Maneuverable Fires (LRMF) Advanced Tech</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AG3 / Extended Range Cannon Artillery (ERCA) Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AG3: <i>Extended Range Cannon Artillery (ERCA) Adv Tech</i>	-	17.760	3.117	3.354	-	3.354	-	6.444	9.357	11.225	0.000	51.257
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires (LRPF) Modernization Priority capabilities. This Project matures and demonstrates artillery technologies including light weight cannon and mount structures, high efficiency recoil cylinders, common lower power fire control hardware, improved fire control software, and improved sensor to shooter communications which will increase range and accuracy without an increase in platform weight. This Project also develops a collaborative environment with analytic capabilities to support Fires and Intel Soldiers.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Extended Range Cannon Artillery Advanced Technology	14.754	-	-
Description: This effort matures and demonstrates extended range Armament technologies including Cannons and Gun Mounts, novel integration for automation, improved fire control, ammunition handling, and improved sensor to shooter communications which will maximize range increases and enable increase precision with next generation munition and target acquisition technology.			
Title: Synchronized High Op-Tempo (SHOT) Targeting for LRPF	3.006	3.003	3.354
Description: This effort develops a collaborative environment with analytic capabilities to support Fires and Intel Soldiers in organizing planning products, and analytics that automate data discovery and development of targets and streamlining workflows that support Course of Action development.			
FY 2022 Plans: Will continue maturation of multi-INT intelligence algorithms capable of facilitating timely creation of intelligence to support long range fires missions. Will integrate with Fires Systems and aggregation with Advanced Field Artillery Tactical Data System (AFATDS) minimum data for effects. Will align to Program of Record (POR) data fabric concepts to automate aggregation of all relevant data necessary to identify target and present actionable fires options.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology	Project (Number/Name) AG3 / Extended Range Cannon Artillery (ERCA) Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will mature software and technical documentation including drawings, concept of operation, and standard operating procedures.</p> <p>I. Will mature and optimize draft training technology package concepts. Will demonstrate targeting cycle support technologies in an operationally relevant exercise environment. Will mature all technology components for validation and demonstration in an integrated targeting data system.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects the planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.114	-
Accomplishments/Planned Programs Subtotals		17.760	3.117	3.354
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AG5 / Extended Range Artillery Munition Suite Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AG5: <i>Extended Range Artillery Munition Suite Adv Tech</i>	-	48.822	33.828	27.461	-	27.461	31.581	9.672	-	-	0.000	151.364
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities. This Project matures and demonstrates extended range artillery technologies including advanced projectile propulsion and guidance technologies to increase range and accuracy.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Extended Range Artillery Munition Suite Advanced Technology	48.822	32.594	25.622
Description: Matures and optimizes long range unitary artillery projectile systems in the areas of range, precision, counter-measure, and payload technologies.			
FY 2022 Plans: Will mature and demonstrate long-range unitary artillery projectile systems to validate system modeling and simulation (M&S), architectures, and component capabilities. Will optimize configurations of projectile concepts to obtain increased performance; will continue to demonstrate integrated concepts for extended range artillery projectiles including: improved guidance algorithms, increased range, sensor optimization and integration. Will improve performance of extended range airframes designs for conventional and cargo munitions for advanced effects compatible with current and future artillery systems. Will continue to mature potential payload configurations for extended range airframe delivered effects that include: dispensing techniques, potential payloads and sub-munition survivability. Will validate post gun launch propulsion range extension technologies.			
FY 2023 Plans: Will continue demonstration of long-range unitary artillery projectile designs to validate system modeling and simulation (M&S), architectures, and component capabilities. Will validate configurations of projectile technologies for increased performance. Will demonstrate gun launched munition survivability and aeroballistic stability. Will mature advanced range extending propulsion technologies. Will complete demonstration of integrated technologies in extended range artillery projectiles including: guidance algorithms, sensors, propulsion, and range extension technologies. Will mature extended range airframe concepts for conventional and cargo munitions for advanced effects compatible with current and future artillery systems. Will demonstrate			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology	Project (Number/Name) AG5 / Extended Range Artillery Munition Suite Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
payload concepts and configurations for extended range gun-launched airframe delivered effects to include sub-munition dispensing techniques and survivability. FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease in accordance with Project plan to demonstrate a unitary warhead Extended Range Artillery Projectile.				
Title: Optionally Manned Artillery Advanced Technology Description: Develop automated cannon artillery solutions for fuze-setting, firing, as well as rearming to exponentially increase rate of fire and out-pace future near-peer, high operational-tempo (OPTEMPO) engagements, and reduce Soldier burden. FY 2023 Plans: Will mature technologies for OPTEMPO long range fires concepts to include: automated fuze setting, automated re-arm and re-supply, and fire control and diagnostics. Will mature modeling and simulation M&S concepts and analytical system trades to improve: the performance, effectiveness, and current and future operations of automated cannon artillery solutions. FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned from Program Element (PE) 0602147A (Long Range Precision Fires Technology) / Project AG4 (Extended Range Artillery Munition Suite Technology) to advance the Advanced Technology Development research on technology efforts to demonstrate automated cannon artillery solutions.		-	-	1.839
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	1.234	-
Accomplishments/Planned Programs Subtotals		48.822	33.828	27.461
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) AG7 / Energetic Materials and Adv Processing Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AG7: Energetic Materials and Adv Processing Adv Tech	-	2.061	2.096	1.954	-	1.954	-	-	-	-	0.000	6.111
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities. This Project matures and demonstrates the performance of energetic materials ranging from medium caliber through large caliber weapons.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Scale-up of Insensitive Energetic Materials	2.061	2.020	1.954
Description: This effort matures and demonstrates the performance and insensitivity of energetic materials ranging from 25mm medium caliber (direct fire) through 155mm large caliber (indirect fire) weapons.			
FY 2022 Plans: Will demonstrate advanced processing methods for increased scale and higher throughput of energetic ingredients and formulations; will demonstrate scale-up of energetic materials and advanced processing methods.			
FY 2023 Plans: Will optimize energetic materials concepts and advanced processing methods to increase scale of manufacture designs and obtain higher throughput of ingredients and formulations. Will validate high-energy explosive and propellant formulations with advanced ignition components in representative applications. Will mature and validate high energy density formulations and material characterization of various insensitive energetic materials.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding reduced as research in the area of propellant formulations and material characterization is reduced.			
Title: FY2022 SBIR/STTR Transfer	-	0.076	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>	Project (Number/Name) AG7 / <i>Energetic Materials and Adv Processing Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638				
FY 2022 to FY 2023 Increase/Decrease Statement:				
Funding transferred in accordance with Title 15 USC ?638				
Accomplishments/Planned Programs Subtotals		2.061	2.096	1.954
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) BO8 / Long Range Precision Fires Advanced Tech (CA)			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BO8: Long Range Precision Fires Advanced Tech (CA)	-	60.000	48.000	-	-	-	-	-	-	-	0.000	108.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
Congressional Interest Item funding provided for Long Range Precision Advanced Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Long Range Precision Advanced Technology.

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 2021	FY 2022
Congressional Add: Missile Rapid Demonstration Capability	25.000	-
FY 2021 Accomplishments: Conducted advanced research in Missile Rapid Demonstration Capability. Work executed by Army Futures Command.		
Congressional Add: Program Increase - Composite Cannon Tubes	5.000	-
FY 2021 Accomplishments: Conducted advanced research in Composite Cannon Tubes. Work executed by Army Futures Command.		
Congressional Add: Program Increase - Hypervelocity Projectile Extended Range	20.000	25.000
FY 2021 Accomplishments: Conducted advanced research in Hypervelocity Projectile Extended Range. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Hypervelocity Projectile Extended Range		
Congressional Add: Program Increase: Tactical Intercepting Vehicle for Access	10.000	-
FY 2021 Accomplishments: Conduct advanced research in Tactical Intercepting Vehicle for Access.		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology	Project (Number/Name) BO8 / Long Range Precision Fires Advanced Tech (CA)
--	---	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Extended Range Artillery Munitions Suite <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Extended Range Artillery Munitions Suite	-	20.000
Congressional Add: Maneuvering Submunitions for Precision Strike Missile <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Maneuvering Submunitions for Precision Strike Missile	-	3.000
Congressional Adds Subtotals	60.000	48.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) BY2 / Advanced Hypersonic Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BY2: Advanced Hypersonic Technology	-	29.099	39.170	36.517	-	36.517	63.854	49.315	74.637	74.617	0.000	367.209
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Hypersonic Precision Fires Modernization Priority capabilities by developing and maturing critical technologies for strategic missiles. Technology development includes critical technologies to improve strategic missile components such as advanced structures and materials, thermal protection systems, navigation systems, data links, and seekers/terminal sensors.

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

Research in this Project is performed by the United States (U.S.) Army Futures Command (AFC) in coordination with the United States Army Rapid Capabilities and Critical Technologies Office (RCCTO).

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

	FY 2021	FY 2022	FY 2023
Title: Hypersonics Advanced Technology	29.099	37.740	36.517
Description: This effort matures and demonstrates new subsystems and components of a hypersonic weapon delivery system to defeat Anti Access/Area Denial (A2/AD) capabilities, suppress adversary Long Range Fires, and engage other payoff/ time critical targets.			
FY 2022 Plans: Will optimize candidate materials and material processing techniques to support critical material decisions for hypersonic weapons application; will mature simulation tools for optimization of vehicle flight performance; will mature guidance, navigation and control (GN&C) technology to dramatically reduce reliance on Global Positioning System (GPS) for navigation accuracy; will mature data links and advanced communication technologies; and will mature seeker / terminal sensor technologies.			
FY 2023 Plans: Will optimize candidate Common Hypersonic Glide Body (CHGB) thermal protection materials and material processing techniques to support critical material decisions for hypersonic weapon applications; will mature simulation tools for optimization of vehicle flight performance; will mature GN&C technology to reduce both size, weight, and power (SWAP) / packaging and reliance on GPS for navigation accuracy and will mature seeker / terminal sensor technologies.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>	Project (Number/Name) BY2 / <i>Advanced Hypersonic Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
The funding decrease is attributed to the completion of the data link capabilities effort.			
Title: Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)	-	1.430	-
FY 2022 Plans: Funding transferred in accordance with Title 15 USC 2638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 2638			
Accomplishments/Planned Programs Subtotals	29.099	39.170	36.517

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603464A / Long Range Precision Fires Advanced Technology				Project (Number/Name) CZ8 / PrSM Modular Payload Advanced Development			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CZ8: PrSM Modular Payload Advanced Development</i>	-	-	-	14.731	-	14.731	18.849	20.944	10.166	-	0.000	64.690
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) funding is realigned from Program Element (PE) 0603464A (Long Range Precision Fires Advanced Technology) / Project AE8 (Land-Based Anti-Ship Missile (LBASM) Advanced Tech).

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by maturing and demonstrating critical technologies for autonomous, Cluster Munition policy compliant, enhanced lethality payloads deployed from Precision Strike Missile to autonomously and cooperatively find and engage the full spectrum of deep moved, moving, dispersed, and poorly located targets in areas with contested access at extended ranges.

Research in this Project complements Program Element (PE) 0602147A (Long Range Precision Fires Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Precision Strike Missile (PrSM) Advanced Development/PrSM Modular Payload	-	-	14.731
Description: Mature and demonstrate critical technologies for the delivery of distributed and enhanced lethality capabilities via extended range missiles. Technology examples include: sensor and associated signal processing technologies for target acquisition, identification, and engagement; datalink and communications technologies to transmit targetable data; compact propulsion technologies to enable dwell time on station; payload dispensing technologies for deploying these payloads from high speed long range missiles; and advanced extended range missile propulsion and guidance technologies.			
FY 2023 Plans: Will continue enhanced lethality payload designs, initiate sub-system testing verifying expected component performance, begin development of advanced extended range missile propulsion and guidance technologies, and update high fidelity simulations to assess integrated missile performance.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603464A / <i>Long Range Precision Fires Advanced Technology</i>	Project (Number/Name) CZ8 / <i>PrSM Modular Payload Advanced Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding realigned from Program Element (PE) 0603464A (Long Range Precision Fires Advanced Technology) / Project AE8 (Land-Based Anti-Ship Missile (LBASM) Advanced Tech) to mature and demonstrate technologies for the next development and increments for the PrSM enhancements.			
Accomplishments/Planned Programs Subtotals	-	-	14.731

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					PE 0603465A / Future Vertical Lift Advanced Technology							
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	220.334	261.880	177.836	-	177.836	170.020	185.821	190.893	184.028	0.000	1,390.812
AI8: Alternative Concept Engine Advanced Technology	-	2.507	3.828	2.038	-	2.038	2.174	2.211	2.211	2.211	0.000	17.180
AJ1: Future UAS Engine Advanced Technology	-	2.355	-	-	-	-	-	-	-	-	0.000	2.355
AJ3: Next Generation Rotorcraft Transmission Adv Tech	-	1.342	1.404	-	-	-	-	-	-	1.447	0.000	4.193
AJ5: Digital Vehicle Management & Control Advanced Tech	-	6.340	-	-	-	-	-	-	-	-	0.000	6.340
AJ7: Advanced Rotors Advanced Technology	-	2.407	2.477	-	-	-	-	-	-	-	0.000	4.884
AJ9: Integ Mission Equip for Vert Lift Systems Adv Tech	-	21.369	23.915	25.066	-	25.066	17.020	3.372	-	-	0.000	90.742
AK3: Aviation Survivability Advanced Technology	-	12.606	3.966	4.118	-	4.118	-	-	-	-	0.000	20.690
AK5: Multi-Role Small Guided Missile Advanced Tech	-	2.519	5.867	11.209	-	11.209	11.743	7.053	-	-	0.000	38.391
AK7: Adv Rotorcraft Armaments Protection Sys Adv Tech	-	6.177	10.541	9.580	-	9.580	3.078	-	-	-	0.000	29.376
AK8: Air Launched Effects Advanced Technology	-	28.542	28.905	28.798	-	28.798	27.895	27.869	27.878	27.871	0.000	197.758
AL1: Adv Teaming for Tactical Aviation Oper Adv Tech	-	40.157	39.953	35.579	-	35.579	42.494	47.869	60.177	49.220	0.000	315.449
AL3: HPC for Rotorcraft Applications Adv Tech	-	4.862	5.073	-	-	-	-	-	-	-	0.000	9.935
AL7: Full Spectrum Targeting Advanced Technology	-	9.610	9.381	8.619	-	8.619	8.804	9.484	10.213	10.194	0.000	66.305

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)					PE 0603465A / Future Vertical Lift Advanced Technology							
AL9: Holistic Sit Awareness and Dec Making Adv Tech	-	4.696	19.392	29.300	-	29.300	22.035	22.759	23.807	22.761	0.000	144.750
AM5: Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
BP8: Future Vertical Lift Air Platform Adv Tech (CA)	-	68.750	82.500	-	-	-	-	-	-	-	0.000	151.250
CA8: Adv Rotocraft Armaments Protection Sys	-	0.963	1.234	2.862	-	2.862	9.551	12.617	12.621	12.618	0.000	52.466
CC4: FVL Radar Advanced Technologies	-	3.207	4.000	3.342	-	3.342	4.384	-	2.369	2.369	0.000	19.671
CG1: Holistic Team Survivability Adv Tech	-	-	6.424	11.898	-	11.898	15.272	17.290	21.124	24.753	0.000	96.761
CH6: Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech	-	-	4.561	-	-	-	-	-	-	-	0.000	4.561
CH7: Power & Thermal Management for FVL Adv Tech	-	-	3.402	4.396	-	4.396	4.275	5.418	7.513	5.392	0.000	30.396
CH8: UAS Survivability Adv Technology	-	-	5.057	-	-	-	-	-	-	-	0.000	5.057
CI8: Adaptive Avionics Advanced Technologies*	-	-	-	-	-	-	-	10.716	18.772	18.767	0.000	48.255
CJ5: Future Vertical Lift Medical Advanced Technology	-	-	-	1.031	-	1.031	1.295	1.553	1.554	1.554	0.000	6.987
CK2: High Speed Maneuverable Missile (HSMM) Adv Tech*	-	-	-	-	-	-	-	17.610	2.654	4.871	0.000	25.135

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates manned and unmanned air vehicle and mission system technologies as well as advanced teaming capabilities to enable Army Future Vertical Lift. Emphasis is on platform and mission system technologies to enhance manned and unmanned air vehicle combat and combat support operations for attack, reconnaissance, air assault, survivability, logistics, and command and control missions. Within this PE, aviation technologies are advanced and integrated into realistic and robust demonstrations.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>
---	---

Research in this PE contributes to the Army Science and Technology (S&T) air systems portfolio and is fully coordinated with efforts in PE 0602148A (Future Vertical Lift Technology), PE 0602183A (Air Platform Applied Research) and PE 0603043A (Air Platform Advanced Technology).

A portion of this PE is directly aligned to the Future Vertical Lift (FVL) Army Modernization Priority.

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

Research in this PE is performed by the United States Army Futures Command (AFC) and the Army Engineering Research and Development Center (ERDC).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	220.334	179.677	0.000	-	0.000
Current President's Budget	220.334	261.880	177.836	-	177.836
Total Adjustments	0.000	82.203	177.836	-	177.836
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	82.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	177.836	-	177.836
• FFRDC Transfer	-	-0.297	-	-	-

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

Project: BP8: *Future Vertical Lift Air Platform Adv Tech (CA)*

Congressional Add: *Joint Tactical Aerial Resupply Vehicle*

Congressional Add: *Advanced Helicopter Seating System*

Congressional Add: *Helicopter Emergency Oil Systems*

Congressional Add: *UAV Fuel Systems Enhancements*

Congressional Add: *Surface Tolerant Advanced Adhesives*

Congressional Add: *Ferrium Steels for Improved Drive Systems*

Congressional Add: *Program Increase - UH-60 main rotor blade modernization*

Congressional Add: *Program Increase - Soldier Information Interface for Aviation Fleet Management Tool*

	FY 2021	FY 2022
	8.000	8.000
	15.000	-
	2.000	-
	2.000	-
	5.000	4.000
	5.000	-
	5.000	5.000
	2.250	-

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>
---	---

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

	FY 2021	FY 2022
Congressional Add: <i>Program Increase - Displays and Safety in DVE</i>	4.000	-
Congressional Add: <i>Program Increase - Digital Engineering Demonstration</i>	8.000	-
Congressional Add: <i>Program Increase - Tethered UAS for All?Terrain Vehicles</i>	12.500	-
Congressional Add: <i>20MM Chaingun Development for FLRAA</i>	-	8.000
Congressional Add: <i>Air Launched Turbojet Missile</i>	-	15.000
Congressional Add: <i>Composite Structures</i>	-	5.000
Congressional Add: <i>Data Refinement and Optimization for Aviation Sustainment</i>	-	4.500
Congressional Add: <i>Degraded Visual Environment</i>	-	3.500
Congressional Add: <i>Digital Backbone</i>	-	5.000
Congressional Add: <i>Elastomeric Imaging</i>	-	3.000
Congressional Add: <i>Fleetspace Maintenance Tool</i>	-	4.500
Congressional Add: <i>Platform Digitization and Maintenance</i>	-	5.000
Congressional Add: <i>Stretch Broken Carbon Fiber</i>	-	10.000
Congressional Add: <i>UAS Fuel Systems Enhancements</i>	-	2.000
Congressional Add Subtotals for Project: BP8		68.750
Congressional Add Totals for all Projects		82.500

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>			Project (Number/Name) A18 / <i>Alternative Concept Engine Advanced Technology</i>				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
A18: <i>Alternative Concept Engine Advanced Technology</i>	-	2.507	3.828	2.038	-	2.038	2.174	2.211	2.211	2.211	0.000	17.180
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides demonstration of adaptable, fuel efficient, and high power to weight engine technologies for potential application to Future Vertical Lift platforms. Research includes development of alternative, adaptive and smart engine technologies to provide improved performance, readiness and affordability across the engine operating envelope for increased operational capability.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Alternative Concept Engine (ACE)	2.507	1.658	-
Description: This effort demonstrates alternative, adaptive, and intelligent engine technologies to provide improved / mission-optimized performance, readiness and affordability across an expanding engine envelope for increased operational capability for Future Vertical Lift (FVL) platforms. The alternative concept engine technology demonstrations planned for this effort are applicable to current and future platforms.			
FY 2022 Plans: Will complete engine sand ingestion and performance demonstration testing. Engine test metrics will include variable output speed, power turbine efficiency, high power to weight ratio, and durability. Engine technologies will be demonstrated to Technology Readiness Level (TRL) 6 for Future Vertical Lift applications.			
FY 2022 to FY 2023 Increase/Decrease Statement: This effort ends in FY22.			
Title: Improved Propulsion Technology Demonstration (IPTD)	-	2.031	2.038

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) A18 / <i>Alternative Concept Engine Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: Effort will develop and execute an advanced engine integration, maintenance, and capability improvement strategy to produce key technology advancements on Future Long Range Assault Aircraft (FLRAA) engine systems, including the ACE engine technologies as appropriate. Full engine validation testing will be completed to TRL 6 providing improved propulsion system performance, maintainability, and durability while reducing integration risk for FVL FLRAA Platform.</p> <p>FY 2022 Plans: Will perform trade-off analysis and design of advanced engine technologies in engine integration, maintainability, and technology to produce improved engine performance, maintainability, and durability to meet FLRAA capability needs.</p> <p>FY 2023 Plans: Will perform engine technology trade-off analyses to optimize improvements in engine performance, weight, maintainability, and durability to meet FLRAA capability needs. Will perform advanced engine integration analyses to reduce engine integration risk onto FLRAA and enduring platforms.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort with reduced analysis of engine technologies and a move towards integration analysis.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.139	-
Accomplishments/Planned Programs Subtotals	2.507	3.828	2.038

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ1 / <i>Future UAS Engine Advanced Technology</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AJ1: Future UAS Engine Advanced Technology</i>	-	2.355	-	-	-	-	-	-	-	-	0.000	2.355
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides full system demonstration of a JP8-fueled, reliable, fuel-efficient and high power-to-weight engine concept for Future Unmanned Aircraft Systems (FUAS).

Work in this Project is fully coordinated with PE 0602148A (Future Vertical Lift Advanced Technology Development).

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

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

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

	FY 2021	FY 2022	FY 2023
Title: Reliable Advanced Small Power Systems	2.355	-	-
Description: This effort demonstrates adaptive and intelligent engine technologies to provide improved / mission- optimized performance, readiness, and affordability across an expanding engine envelope for increased operational capability for group 3 and 4 FUAS platforms.			
Accomplishments/Planned Programs Subtotals	2.355	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ3 / <i>Next Generation Rotorcraft Transmission Adv Tech</i>
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AJ3: Next Generation Rotorcraft Transmission Adv Tech</i>	-	1.342	1.404	-	-	-	-	-	-	1.447	0.000	4.193
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to:
 Program Element (PE) 0603043A (Air Platform Advanced Research)
 Project CX2 (Next Generation Aviation Transmission Adv Tech)

A. Mission Description and Budget Item Justification

This Project develops and ground demonstrates variable-speed transmission technologies that can be matured and integrated into the development of Future Vertical Lift (FVL) platforms.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation Rotorcraft Transmission	1.342	-	-
Description: This effort demonstrates advanced rotorcraft drive technologies with the potential to increase the horsepower-to-weight ratio; reduce drive system noise; reduce production, operating and support costs; and provide automatic component impending-failure detection. The drive system demonstrators for this effort will be applicable to Future Vertical Lift (FVL) platforms.			
Title: High Reduction-Ratio Transmission.	-	1.353	-
Description: This effort will mature and demonstrate the technologies necessary for development, design, fabrication, and testing of a high reduction-ratio transmission in two stages or less (60:1 reduction ratio) with high efficiency and improved reliability against corrosion and seal leakage. Technology demonstrations from this effort will be applicable to FVL platforms.			
FY 2022 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ3 / <i>Next Generation Rotorcraft Transmission Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Begin design of a transmission that demonstrates a 60:1 reduction ratio two-stage gearbox design that provides significant weight and volume reduction for extended range and component life for manned and unmanned applications. Design will include advanced gear materials and advanced seals for high reliability and reduced life-cycle costs.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE 0603043A (Air Platform Advanced Research) / Project CX2 (Next Generation Aviation Transmission Adv Tech).</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.051	-
Accomplishments/Planned Programs Subtotals		1.342	1.404	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ5 / <i>Digital Vehicle Management & Control Advanced Tech</i>
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AJ5: Digital Vehicle Management & Control Advanced Tech</i>	-	6.340	-	-	-	-	-	-	-	-	0.000	6.340
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project designs, integrates, and demonstrates Future Vertical Lift (FVL) flight control and Vehicle Management Systems (VMS) technologies. Technologies demonstrated include: advanced flight control laws and autonomy; automatic reconfiguration for speed/damage; coupled cockpit symbology and haptic cueing; and handling qualities requirements for new platform concepts. Develops and demonstrates structures technologies and mission-adaptive autonomy and control algorithms that provide level 1 handling qualities, resilience to extreme and hostile environments, damage-mitigation by reconfiguration of redundant controls, increased agility and speed with minimal fatigue, increased payload and weight efficiency, optional pilotage and manned-unmanned teaming capabilities, cognitive off-loading, and reduction of structural maintenance burden.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Adaptive and Resilient Tactical Autonomy, Controls, and Structures (ARTACS) Adv Tech	6.340	-	-
Description: Develop, integrate, and demonstrate autonomy, controls, and advanced structures technologies to ensure mission success for manned/unmanned, multiple capability set FVL platforms in the contested environment of multi-domain operations.			
Accomplishments/Planned Programs Subtotals	6.340	-	-

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

N/A

Remarks

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ5 / <i>Digital Vehicle Management & Control Advanced Tech</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ7 / <i>Advanced Rotors Advanced Technology</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AJ7: Advanced Rotors Advanced Technology</i>	-	2.407	2.477	-	-	-	-	-	-	-	0.000	4.884
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project CX1/ Advanced Rotors Advanced Tech.

A. Mission Description and Budget Item Justification

This Project demonstrates and integrates new technologies that enable global and highly efficient/reliable operations for Future Vertical Lift (FVL) aircraft and Future Unmanned Aircraft Systems (FUAS) throughout the flight envelope.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Rotors Technology	2.407	-	-
Description: This effort demonstrates full scale, integrated rotor system technologies through the assessment of alternative designs aimed to satisfy future capability needs for FVL and FUAS increased system durability, efficiency, speed, range, and payload. Technologies include: integrated high speed, low drag rotor technologies for high speed configurations; interactional aero tailoring between rotor and body & auxiliary lift/ propulsors; light weight, low volume, efficient and high authority electro-mechanical actuators (EMAs); reliable and safety critical actuators/hubs/controls for Independent Blade Control (IBC)/swash plateless rotors; damage compensation/load alleviation; active/passive flow control; and automated track and balance.			
Title: High Speed, Highly Efficient Rotors	-	2.387	-
Description: This effort demonstrates full scale, integrated rotor system technologies through the assessment of alternative designs aimed to satisfy future capability needs for FVL increased system durability, efficiency, speed, range, and payload. Technologies include: integrated high speed, low drag rotor technologies for high speed configurations; interactional			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ7 / <i>Advanced Rotors Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>aerodynamics tailoring between rotor and body & auxiliary lift/ propulsors; light weight, low volume, efficient and high authority EMAs; reliable and robust actuators/hubs/controls for IBC/swashplateless rotors; active/passive flow control; and automated track and balance.</p> <p>FY 2022 Plans: Will complete detailed design of high speed, highly efficient rotor system for FVL platforms. Will commence fabrication of demonstration hardware. Will commence structural test planning.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CX1 Advanced Rotors Advanced Tech</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.090	-
Accomplishments/Planned Programs Subtotals		2.407	2.477	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AJ9 / <i>Integ Mission Equip for Vert Lift Systems Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ9: <i>Integ Mission Equip for Vert Lift Systems Adv Tech</i>	-	21.369	23.915	25.066	-	25.066	17.020	3.372	-	-	0.000	90.742
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a mission systems architecture to support Future Vertical Lift (FVL) through utilization of a reconfigurable and flexible tiered architectural approach.

This Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Integrated Mission Equipment for Vertical Lift Systems	21.369	23.037	25.066
<p>Description: Develops and demonstrates a mission systems architecture to support FVL through utilization of a reconfigurable and flexible tiered architectural approach. The approach will consist of the following: Maturing and implementing Model Based Engineering methods and Modular Open Systems Architecture strategies; instantiating an architecture verification environment and developing an agile and resilient digital backbone to support the rapidly changing threat environment including the digital battleground.</p> <p>FY 2022 Plans: Will complete purchasing, assembly, and checkout of the Architecture Verification Environment (AVE) facility to provide validation and verification of the Fiscal Year 2021 (FY21) National Defense Authorization Act (NDAA) Modular Open Systems Approach (MOSA) requirements. Will mature the verification process and conduct MOSA validation and verification on FVL, Enduring Fleet and science and technology (S&T) developed artifacts to identify and close gaps for FVL. Will develop MOSA engineering processes and training materials for wider adoption of MOSA. Will acquire candidate Digital Backbone technologies to evaluate in the AVE facility and update the Digital Backbone Objective Architecture. Will acquire core, reusable mission capabilities (e.g., route planning, digital map) to test Model Based System Engineering (MBSE), airworthiness and cyber qualification methods. Will expand the cloud-based Architecture Collaboration Environment (ACE) capabilities and maintain Authority to Operate (ATO)</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AJ9 / <i>Integ Mission Equip for Vert Lift Systems Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>to develop MBSE specifications for the Digital Backbone, core software infrastructure capabilities, and Mission Systems Flying Testbed (MSFTB) to be integrated on UH-60M Black Hawk . Will acquire core software infrastructure capabilities, that are airworthy, and cyber security certifiable, for the MSFTB and conduct laboratory integration assessments. Will acquire and install the Digital Backbone A-Kit in a UH-60M aircraft. Will design and acquire the MSFTB ground and flight test equipment and begin component assembly in the ground lab environment. Will perform a model-based source selection of multiple MSFTB Mission System Integrators for future down-selection based on FY21 NDAA MOSA requirements</p> <p>FY 2023 Plans: Will mature and improve automation of AVE capabilities to validate and verify FY21 National Defense Authorization Act MOSA requirements. Will demonstrate AVE capabilities to evaluate Future Vertical Lift and Enduring Fleet vendor designs for MOSA conformance. Will demonstrate incremental airworthiness and cyber security qualification for infrastructure capabilities enabling affordability and faster to field for innovative integration. Will demonstrate Digital Backbone A-Kit performance and ability to ease mission systems installation in an experimental UH-60M aircraft. Will demonstrate third party integration of mission system components in the MSFTB lab.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.878	-
Accomplishments/Planned Programs Subtotals		21.369	23.915	25.066
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AK3 / <i>Aviation Survivability Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK3: <i>Aviation Survivability Advanced Technology</i>	-	12.606	3.966	4.118	-	4.118	-	-	-	-	0.000	20.690
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates increased Future Vertical Lift (FVL) survivability through the integration and demonstration of technologies that reduce platform signatures, improve threat warning and countermeasures against integrated networked air and ground threat systems. Also matures and demonstrates unmanned aircraft systems (UAS) survivability technologies to enable manned/unmanned team based approaches to enable operation in contested peer/near peer environments.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Survivability Against Integrated Networked Threats	5.093	3.821	4.118
Description: This effort increases rotorcraft survivability by reducing platform signatures, providing the means to more efficiently counter enemy detection and tracking systems			
FY 2022 Plans: Will mature Survivability Correlator software and supporting components, such as the interfaces to available sensors and effectors, for demonstration. Will integrate relevant sensors and effectors, verify functionality, and demonstrate own-ship Aircraft Survivability Correlator capabilities. Will continue development of team-based survivability technologies.			
FY 2023 Plans: Will continue to mature own-ship Aircraft Survivability Correlator capabilities and technologies. Will begin integration and ground testing of Aircraft Survivability Correlator software onto a surrogate FVL aircraft. Will demonstrate Aircraft own- ship Survivability Correlator at an open air range with surrogate threat systems to avoid and counter.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AK3 / <i>Aviation Survivability Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding change reflects planned lifecycle of this effort.				
Title: Cognitive Countermeasures Maturation and Demonstration Description: This effort matures and demonstrates adaptive countermeasure technologies that provide platform protection against guided threats. It provides countermeasure electronics for adaptive decision making and countermeasure components that enable systems to counter the characteristics of agile threats.		2.000	-	-
Title: EW Air Sensors / Countermeasures Description: This effort matures and demonstrates sensor and countermeasure technologies that provide platform protection and integrated cueing against advanced and emerging threats to aviation platforms. It provides advanced sensors and effectors capable of detecting and responding to threats with diverse signatures.		4.483	-	-
Title: UAS Survivability Demonstration Description: UAS Survivability Technology (UST) addresses the evolving threat environment to support the Maneuver Force within the Multi-Domain Battle concept. UST will develop and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance. This work supports Future Vertical Lift and Advanced Unmanned Aircraft Systems.		1.030	-	-
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.145	-
Accomplishments/Planned Programs Subtotals		12.606	3.966	4.118
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AK5 / <i>Multi-Role Small Guided Missile Advanced Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK5: <i>Multi-Role Small Guided Missile Advanced Tech</i>	-	2.519	5.867	11.209	-	11.209	11.743	7.053	-	-	0.000	38.391
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a holistic lethality solution for current Army Aviation and Future Vertical Lift (FVL) Modernization Priority. This Project matures and demonstrates critical technology and designs components for future affordable rockets and missiles to provide overwhelming defeat of conventional and asymmetrical threats in all environments. Matures and demonstrates component technologies to enable an expeditionary short-to-medium range loitering maneuvering missile with man-in-the-loop capability for situational awareness, targeting, and lethal effects against hard and soft targets; and matures and demonstrates critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Single Multi-Mission Attack Missile	2.519	-	-
Description: Matures and demonstrates component technologies for an expeditionary short-to- medium range loitering missile with man-in- the-loop capability for situational awareness, targeting, and lethal effects against hard and soft targets.			
Title: Multiple Simultaneous Engagement Technologies (MSET)	-	5.653	11.209
Description: Matures and demonstrates critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles against stationary and moving hard/soft targets, image-based target discrimination/shared situation awareness/lock-on, and multi-missile control digital datalink with inter-missile cooperative networked communications. The end-state is a multi-missile Organic command and control (C2) solution that handles all aspects of sensor integration, fire control, and airspace management. This capability will support overwhelming lethal effects against anti-access/aerial denial (A2AD) / Integrated Air Defense Systems (IADS).			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AK5 / <i>Multi-Role Small Guided Missile Advanced Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Will mature and demonstrate component technologies through system level simulation integration and initial Hardware In the Loop (HWIL) component integration. Will continue to mature and improve component technologies utilizing simulation and HWIL results with the objective to suppress, defeat and/or destroy near peer A2AD/IADS threats at maximum survivable ranges.</p> <p><i>FY 2023 Plans:</i> Will exercise flight hardware and software in the HWIL laboratory while simulating flight environments to demonstrate system performance and form predictions of outcome for simultaneous missile engagements, dynamic re-tasking of missiles in flight, target acquisition, terminal engagement, and operator workload. Will continue high-fidelity simulation analyses against MSET scenarios to verify subcomponent function and perform relevant trades to feed HWIL and flight test asset integration efforts. Will use simulation and HWIL results to continue developmental flight tests to demonstrate and validate system performance.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding increase advances critical technology maturation and evaluations required for future missile efforts concerning simultaneous multiple launches in support of the FVL Army Modernization Priority area.</p>			
<p><i>Title:</i> FY2022 SBIR/STTR Transfer</p> <p><i>Description:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>	-	0.214	-
Accomplishments/Planned Programs Subtotals	2.519	5.867	11.209

<p>C. Other Program Funding Summary (\$ in Millions) N/A</p> <p>Remarks</p> <p>D. Acquisition Strategy N/A</p>

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AK7 / <i>Adv Rotorcraft Armaments Protection Sys Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AK7: Adv Rotorcraft Armaments Protection Sys Adv Tech</i>	-	6.177	10.541	9.580	-	9.580	3.078	-	-	-	0.000	29.376
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project investigates and demonstrates a holistic lethality solution for Future Vertical Lift (FVL) offensive and defensive applications, focused on but not limited to Future Attack Reconnaissance Aircraft. Develop components for use in multi-role armament solutions for fire control, armament systems, munitions and integration of threat agnostic countermeasures.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Rotorcraft Armament and Protection System (ARAPS) - Future Attack Reconnaissance Aircraft (FARA)	5.744	9.572	6.762
Description: This effort matures and demonstrates a holistic medium caliber lethality solution for Future Vertical Lift offensive applications. Develops components for use in multi-role armament solutions for fire control, software, armament systems, and munitions.			
FY 2022 Plans: Will mature aviation specific fire control software and algorithms to support aviation requirements for turreted medium caliber weapon targeting solutions including Future Vertical Lift Future Attack Reconnaissance Aircraft?s. Will integrate and optimize a 20mm armament system onto a representative aviation platform.			
FY 2023 Plans: Will integrate medium caliber weapon with aviation specific fire control software. Will mature and demonstrate turreted medium caliber weapon platforms with targeting solution software for use in aviation systems including Future Vertical Lift Future Attack Reconnaissance Aircraft.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AK7 / <i>Adv Rotorcraft Armaments Protection Sys Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
FY23 decrease is due to identification of requirements for FARA that are suitable for the Army's needs.				
<p>Title: ARAPS-Dispenser</p> <p>Description: This effort matures and demonstrates a dispenser countermeasure, a component of the holistic survivability solution for Future Vertical Lift defensive applications. Develop components for use in multi-role countermeasure solutions for fire control, software and countermeasure systems.</p> <p>FY 2022 Plans: Will optimize design of countermeasure dispenser to further address survivability for current and future aviation platforms. Will demonstrate capabilities of an optimized counter measure dispenser.</p> <p>FY 2023 Plans: Will optimize tracking and dispensing capabilities for countermeasure dispenser to increase survivability of current and future aviation platforms. Will mature capability of fire control systems with use of countermeasure dispenser.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle of this effort in design optimization of dispenser.</p>		0.433	0.585	2.818
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.384	-
Accomplishments/Planned Programs Subtotals		6.177	10.541	9.580
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AK8 / <i>Air Launched Effects Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK8: <i>Air Launched Effects Advanced Technology</i>	-	28.542	28.905	28.798	-	28.798	27.895	27.869	27.878	27.871	0.000	197.758
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the ability to launch an Unmanned Aircraft System (UAS) from a manned or unmanned Future Vertical Lift (FVL) aircraft at tactical altitudes and to control the UAS from the cockpit or a crew station; and assesses the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Air Launched Effects	28.542	27.850	28.798
<p>Description: Develop and demonstrate the ability to launch a future unmanned aircraft system (FUAS) from FVL platform at tactical altitudes, and to control the UAS from the cockpit or a crew station. Assess the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios. These air-launched FUAS will employ a variety of non-lethal effects including: electronic attack, decoy, and communications relay.</p>			
<p>FY 2022 Plans: Will integrate synthetic aperture radar payload, enhanced target acquisition software, and complimentary autonomous behaviors into air launched effects UAS, and evaluate increased capability to detect, identify, locate, and report threats through flight testing. Will integrate decoy payloads and associated individual UAS autonomous employment behaviors into air launched effects, and evaluate system performance through flight testing. Will integrate advanced communications payload into air launched effects UAS and evaluate effectiveness for Joint all-domain operations. Will mature and integrate a modular open systems approach (MOSA) based mission equipment package in accordance with approved hardware and software architectures to allow rapid technology insertion and payload integration on the future family of air launched effects air vehicles. Will mature and evaluate air launched UAS recovery system, enabling cost savings and improved mission capability through asset reuse. Will demonstrate</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AK8 / <i>Air Launched Effects Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>improvements in mission effectiveness enabled through these air launched effects enhancements as a part of a multi-domain combined arms team through participation in Joint service all-domain experiments.</p> <p>FY 2023 Plans: Will integrate electronic warfare (EW) payload and employment software into air launched effects air vehicle and evaluate ability to disrupt and jam threat systems using a single human supervising teams of air launched effects UAS through flight testing. Will integrate secure, anti-jam communications payload into air launched effects UAS and evaluate effectiveness for Joint all-domain operations. Will verify ability to rapidly insert software and payload technologies into the modular open systems approach (MOSA) based mission system architecture. Will demonstrate team of Detect, Identify, Locate, and Report (DILR), Decoy, Disrupt, and Lethal air launched effects UAS, equipped with advanced teaming software, executing collaborative reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, decoy, and EW to disrupt or jam as a part of a multi-domain combined arms team through participation in Joint all-domain flight experiments.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>			
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	1.055	-
Accomplishments/Planned Programs Subtotals	28.542	28.905	28.798

<p>C. Other Program Funding Summary (\$ in Millions) N/A</p> <p>Remarks</p>
<p>D. Acquisition Strategy N/A</p>

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AL1 / <i>Adv Teaming for Tactical Aviation Oper Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL1: <i>Adv Teaming for Tactical Aviation Oper Adv Tech</i>	-	40.157	39.953	35.579	-	35.579	42.494	47.869	60.177	49.220	0.000	315.449
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates and drafts frameworks for autonomous teaming behaviors and autonomous decision making for Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platform formations in combined arms operations.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Teaming Demonstration	32.378	30.885	27.224
<p>Description: Develop and demonstrate teaming behaviors and autonomous decision making for mixed FVL and FUAS platform formations in combined arms operations that are beyond current Manned-Unmanned Teaming (MUM-T) technologies. Focus areas include: resilient autonomous algorithms; self-organizing unmanned formations; distributed command and control; and navigation. This effort will also demonstrate multi-platform distributed apertures of multispectral sensors for threat detection and awareness and improved reliability through adaptation in autonomous systems.</p> <p>FY 2022 Plans: Will mature and integrate advanced teaming technologies into mission systems teaming architecture for mixed formations of manned and unmanned aircraft, and demonstrate through flight testing multi-Unmanned Aircraft System (UAS) collaborative reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, and decoy in GPS denied and communications degraded conditions. Will simulate autonomous decoy and electronic attack synchronized UAS team behaviors in mission representative vignettes. Will verify modular open systems integration approaches for rapidly upgradable and transitionable team autonomy. Will integrate collaborative autonomous behaviors including team mission command, autonomous RSTA execution, electronic warfare mission planning to disrupt or jam, coordinated RF homing and sensing using multiple aircraft equipped with aided target recognition, decoy mission management to divulge threats, and team adaptations network disruptions, into teams of</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL1 / <i>Adv Teaming for Tactical Aviation Oper Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>UAS, including air launched effects, and demonstrate advanced teaming concepts of operations and improvements in mission effectiveness as a part of a multi-domain combined arms team through participation in Joint service all-domain experiments.</p> <p>FY 2023 Plans: Will mature and flight-demonstrate advanced teaming technologies integrated into mission systems architecture for real-time mission planning and synchronized execution of collaborative team reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, decoy, and electronic warfare (EW) to disrupt or jam using mixed formations of manned and unmanned aircraft, including air launched effects, as a part of a multi-domain combined arms team through participation in Joint all-domain experiments. Will test and evaluate autonomous in-stride replanning software that dynamically adapts battlefield situational awareness updates, network connectivity, and team member capability. Will simulate autonomous team of teams operations facilitating integrated air defense system (IADS) breach capability in contested conditions using mission representative vignettes. Will further enhance and verify modular open systems integration approaches for rapidly upgradable and transitionable team autonomy.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decrease reflects the conclusion of Subsystem Technology development efforts and concentration on mission systems integration demonstrations.</p>				
<p>Title: Sensors / Multi-Function Imagers for Future Aviation</p> <p>Description: Mature and demonstrate multi-function sensing system concepts to increase FVL manned platform survivability and situational awareness. This will enable the manned FVL platforms to engage in multi-domain advanced teaming operations and leverage autonomous behaviors of both manned and unmanned aviation platforms. This effort will enable tactical operations in complex environments (e.g. high threat, degraded visuals, and urban) through the use of sensing modules suitable for multiple tactical applications. The multifunction sensor approach will mitigate the need for separate dedicated threat warning and situational awareness imaging sensor modules, thus reducing the total cost and logistics burden for future aviation systems.</p> <p>FY 2022 Plans: Will mature digital readout dual band infrared sensor technologies for both pilotage and threat warning applications. Will mature digital readout integrated circuit based multispectral camera modules. Will demonstrate both laboratory and field test measurements to corroborate the higher sensitivity and fast frame rate performance of the novel multispectral cameras. Will integrate multispectral camera modules onto a manned airborne testbed platform.</p> <p>FY 2023 Plans: Will demonstrate digital readout integrated circuits integrated into multispectral camera modules for improved pilotage and threat warning capabilities. Will validate multispectral sensing and threat warning capabilities against various signatures and clutter. Will</p>		7.779	7.610	8.355

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL1 / <i>Adv Teaming for Tactical Aviation Oper Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
optimize digital readout frame integration, adjustable frame rate and image processing settings for improved camera performance in varying environments and concepts of operations. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	1.458	-
Accomplishments/Planned Programs Subtotals	40.157	39.953	35.579

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>			Project (Number/Name) AL3 / <i>HPC for Rotorcraft Applications Advanced Technology</i>				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL3: <i>HPC for Rotorcraft Applications Advanced Technology</i>	-	4.862	5.073	-	-	-	-	-	-	-	0.000	9.935
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project DC3/ HPC for Army Aviation Concepts.

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the use of high-fidelity computational fluid dynamics for Future Vertical Lift (FVL) platforms through the utilization of Department of Defense (DoD) High- Performance Computing (HPC) and software tools for cutting-edge modeling and simulation, as well as adding software capabilities for workflow automation and design space exploration. Efforts in this Project are also applicable to the family of Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platforms.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

Research is performed by the United States (US) Army Engineer Research and Development Center and coordinated with US Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Engineered Resilient Systems (ERS) for Army Aviation	4.862	2.987	-
Description: This effort supports Future Vertical Lift by exploiting advancements in physics-based software tools to provide rapid engineering analysis of proposed rotorcraft platforms, providing high-fidelity computational modeling of candidate Future Attack Reconnaissance Aircraft (FARA) platforms during the FARA down-selection, increasing the speed of simulations by automating simulation setup and execution on DoD HPC systems, and maturing and demonstrating the use of advanced machine learning techniques for aviation datasets to inform both the development of FVL systems and current operations.			
FY 2022 Plans: Improve the accuracy and continue to optimize the execution of low, medium, and high-fidelity computational modeling that supports ongoing analysis of the FARA and Future Long-Range Assault Aircraft (FLRAA) platforms. Improve the engineering			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL3 / <i>HPC for Rotorcraft Applications Advanced Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
analysis of the FARA and FLRAA systems through the inclusion of acoustic modeling and surrogate techniques. Advance surrogate modeling techniques to increase the speed of analysis for FVL platforms. FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project Project DC3/ HPC for Army Aviation Concepts.				
Title: Engineered Resilient Systems (ERS) for Advanced Army Aviation Concepts Description: This effort supports Future Vertical Lift (FVL) by utilizing advanced machine-assisted design algorithms to explore design spaces and choose resilient platform variants. Advanced computational techniques will leverage automated design processes to expand computational testbeds in support of testing and evaluation. Increase high accuracy physics in modeling and simulation to optimize platforms for all operational environments and mission scenarios. Provide multi-fidelity computational models of candidate Future Attack Reconnaissance Aircraft (FARA), Future Long-Range Assault Platforms (FLRAA), and Future Tactical Unmanned Aircraft Systems (FTUAS) platforms to support acquisition decision-makers. FY 2022 Plans: Optimize the execution of low, medium, and high-fidelity computational modeling that supports analysis of FVL Family of Systems, Air-Launched Effects, and candidate FTUAS platforms. Provide tools for evaluating Air-Launched Effects and UAS platform's ability to support mission objectives and platform effectiveness through the expansion of computational testbeds. Demonstrate the use of advanced machine-assisted design techniques to increase the speed of analysis for FVL Family of Systems and UAS platforms. Evaluate the expansion of computational modeling capability to secret and above secret high-performance computing. FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project Project DC3/ HPC for Army Aviation Concepts.		-	1.901	-
Title: FY 2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.185	-
Accomplishments/Planned Programs Subtotals		4.862	5.073	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL3 / <i>HPC for Rotorcraft Applications Advanced Tech</i>

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AL7 / <i>Full Spectrum Targeting Advanced Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AL7: Full Spectrum Targeting Advanced Technology</i>	-	9.610	9.381	8.619	-	8.619	8.804	9.484	10.213	10.194	0.000	66.305
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates next generation targeting concepts for Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platforms.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Full Spectrum Targeting	9.610	9.038	8.619
<p>Description: This effort will mature and demonstrate key targeting sensor system concepts to enable the FVL and FUAS modernization priorities. Effort will leverage advancements in laser, infrared imaging focal plane arrays, compact long-range optics, and multispectral system technologies to develop a stabilized, payload that can actively and/or passively image in multiple spectral bands simultaneously to provide robust targeting and situational awareness capabilities for the prevailing battlefield conditions. Effort will demonstrate the ability of multispectral sensing to autonomously scan areas of interest and identify tactical threats with reduced cognitive workloads through sensor fusion and automated spectral selection.</p> <p>FY 2022 Plans: Will mature and integrate a novel dual-band infrared sensor along with advanced active / passive optical components and active / passive sensors into a steerable turret. Will mature approaches for spectral imaging for target detection using the steerable turret to conduct data collections with multiple spectral bands against military targets in relevant environments. Will mature approaches for detection of hidden, obscured, and decoy targets to improve sensor target recognition and identification performance. Will demonstrate automated processing techniques in multiple spectral bands suitable for detection, recognition and identification of FVL and FUAS relevant target sets. Will develop techniques for sensor fusion and automated selection of optimal spectral bands to reduce FVL and FUAS cognitive burden.</p> <p>FY 2023 Plans:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL7 / <i>Full Spectrum Targeting Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will demonstrate improved threat detection range performance using a steerable turret with dual-band infrared sensor paired to novel, compact long-range optical components. Will validate approaches for multispectral imaging to detect military targets in relevant environments. Will optimize automated scanning and processing techniques in multiple spectral bands suitable for detection, recognition and identification (DRI) of FVL and FUAS relevant target sets. Will optimize sensor fusion techniques and automatic selection of optimal spectral bands to reduce FVL and FUAS operator burden. Will validate automated sensor scanning and DRI performance.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decrease is primarily a result of reduced hardware research and development efforts and long-lead material purchase, with more emphasis shifting to optimization and demonstration of automated scanning, spectral modalities, and detection capabilities.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.343	-
Accomplishments/Planned Programs Subtotals		9.610	9.381	8.619
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) AL9 / <i>Holistic Sit Awareness and Dec Making Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL9: <i>Holistic Sit Awareness and Dec Making Adv Tech</i>	-	4.696	19.392	29.300	-	29.300	22.035	22.759	23.807	22.761	0.000	144.750
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a pilotage and decision aiding system that allows for care free operations in complex and hostile environments through: demonstration of a comprehensive human machine interface for all situational awareness (SA) domains (terrain & obstacles, threat, weather, & environment); and demonstration of decision aiding technologies to reduce cognitive loading of air crews during operations in complex and hostile environments.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Holistic Situational Awareness and Decision Making	4.696	9.210	12.835
Description: This program directly contributes to Future Vertical Lift (FVL) to ensure Future Aircraft pilots have the necessary situational awareness, accurate understanding of the tactical mission, and ability to decide faster than our adversaries.			
FY 2022 Plans: Will demonstrate FVL Air Mission Commander (AMC) increased effectiveness when equipped with the combined capabilities of a fused world model that includes both geo-referenced sensor output and abstract situational data, decision aiding tools, autonomous flight controls, and pilot cueing; Will participate in flight demonstration(s) to assess this capability's impact on increasing mission effectiveness and reducing pilot cognitive workload			
FY 2023 Plans: Will demonstrate FVL cockpit crew increased effectiveness and decreased workload when equipped with a situational awareness world model, decision aiding tools, pilot-on-the-loop autonomy, and multi-sensory cueing. Workload and effectiveness will be measured using both subjective and objective means including biometrics. Will participate in Fiscal Year 2023 (FY23) Project Convergence through flight demonstration to assess this capability's impact in relevant mission scenarios.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AL9 / <i>Holistic Sit Awareness and Dec Making Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funding increase reflects increased contracted efforts in Decision Aiding technology development, simulation/evaluation events, and increased participation in demonstrations.				
<p>Title: Multi-function RF for FVL Platforms</p> <p>Description: This effort matures and demonstrates multi-function radio-frequency (RF) sensor technologies to support the FVL family of systems. It provides integrated software and hardware technologies that enable the use of common electronics and system components to support varied functions, such as enhanced situational awareness, threat-detection and localization, targeting, communications, and aircraft pilotage. This will result in improved performance for these critical functions and reduced requirements for size, weight, and power for mission equipment across FVL platforms.</p> <p>FY 2022 Plans: Will analyze the technical requirements of multiple functions and perform engineering analysis to determine technical specifications; will develop technical models of multi-function RF components and assess expected performance against mission requirements; will initiate development of multi-function RF components.</p> <p>FY 2023 Plans: Will develop multi-function RF components from derived technical specifications. Will characterize the components in the laboratory and analyze their expected performance against the full set of mission requirements. Will develop software to enable resource management of multiple RF functional modes. Will complete design of the overall RF multi-function radio-frequency (RF) sensor system including hardware and software.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects progression of the technology development from design and modeling to development and characterization of the hardware.</p>		-	7.585	14.382
<p>Title: Early Human Systems Integration Demonstrations</p> <p>Description: Human Systems Integration (HSI) analysis assesses and matures technologies to optimize pilot situational awareness and workload management, crew task automation and decision-aiding, information management, and advanced crew station interfaces. The objective of this effort is to reduce crew decision and task execution timelines in a tactically challenging mission environment.</p> <p>FY 2022 Plans:</p>		-	1.884	2.083

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advance d Technology</i>	Project (Number/Name) AL9 / <i>Holistic Sit Awareness and Dec Making Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will perform HSI analysis during simulation and flight demonstration to assess and enhance technologies for advanced crew station interfaces, pilot decision-aids, and information management to reduce decision timelines. Will collect pilot performance data and provide knowledge products to assess and help mature crew-enabling technologies.</p> <p>FY 2023 Plans: Will demonstrate effects of crew task automation, decision-aiding, and augmented pilot displays on Soldier performance and system effectiveness by conducting human performance and human-system interface analyses via simulations, modeling, and evaluation of advanced technologies; will provide early (Advanced Technology Demonstration) assessment of HSI considerations for advanced crew station technology design, automation and decision-aiding, thereby reducing life-cycle costs; will optimize HSI designs of highest priority Army technologies and systems including advanced crew station technology design and automation for enhanced Soldier performance and system effectiveness. In addition, will demonstrate effects of decision aides, User Centered Design, more effective use of automation in command and control (C2), training and crew automation for accelerated expertise, design concepts to support rapid and enhanced sense-making, and a multilevel performance assessment in support of Air and Missile Defense.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.713	-
Accomplishments/Planned Programs Subtotals		4.696	19.392	29.300
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) AM5 / <i>Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AM5: Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech</i>	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and demonstrates at the system level, integrated power technologies (including power generation, distribution, and control along with advanced energy storage) and thermal management technologies to provide significantly higher electrical power capability to Future Vertical Lift (FVL) aircraft while addressing consequential size, weight, pulsed power, and thermal issues. Provides power capability for advanced electric aeromechanical effectors, advanced mission systems for route planning and teaming, and for advanced survivability and electronic warfare capability.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Optimized Energy for C5ISR Platforms Advanced Technology	1.925	-	-
Description: Enable advanced survivability systems on FVL platforms through component development improved high power and energy storage technologies, higher capacity lower Size, Weight, and Power (SWaP) cooling systems, and more efficient electrical architectures.			
Accomplishments/Planned Programs Subtotals	1.925	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) BP8 / <i>Future Vertical Lift Air Platform Advanced Technology (CA)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BP8: <i>Future Vertical Lift Air Platform Adv Tech (CA)</i>	-	68.750	82.500	-	-	-	-	-	-	-	0.000	151.250
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Congressional Interest Item funding provided for Future Vertical Lift Air Platform Advanced Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Future Vertical Lift Air Platform Advanced Technology.

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 2021	FY 2022
Congressional Add: Joint Tactical Aerial Resupply Vehicle	8.000	8.000
FY 2021 Accomplishments: Conducted advanced research in Joint Tactical Aerial Resupply Vehicle. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Joint Tactical Aerial Resupply Vehicle		
Congressional Add: Advanced Helicopter Seating System	15.000	-
FY 2021 Accomplishments: Conducted advanced research in Advanced Helicopter Seating System. Work executed by Army Futures Command.		
Congressional Add: Helicopter Emergency Oil Systems	2.000	-
FY 2021 Accomplishments: Conducted advanced research in Helicopter Emergency Oil Systems. Work executed by Army Futures Command.		
Congressional Add: UAV Fuel Systems Enhancements	2.000	-
FY 2021 Accomplishments: Conducted advanced research in UAV Fuel Systems Enhancements.		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) BP8 / <i>Future Vertical Lift Air Platform Advanced Tech (CA)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	
Work executed by Army Futures Command.			
Congressional Add: Surface Tolerant Advanced Adhesives FY 2021 Accomplishments: Conducted advanced research in Surface Tolerant Advanced Adhesives.	5.000	4.000	
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for FVL Surface Tolerant Adhesives			
Congressional Add: Ferrium Steels for Improved Drive Systems FY 2021 Accomplishments: Conducted advanced research in Ferrium Steels for Improved Drive Systems.	5.000	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - UH-60 main rotor blade modernization FY 2021 Accomplishments: Conducted advanced research in UH-60 Main Rotor Blade Modernization.	5.000	5.000	
Work executed by Army Futures Command. FY 2022 Plans: Congressional Interest Item funding provided for UH-60 Main Rotor Blade Modernization			
Congressional Add: Program Increase - Soldier Information Interface for Aviation Fleet Management Tool FY 2021 Accomplishments: Conducted advanced research in Soldier Information Interface for Aviation Fleet Management Tool.	2.250	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - Displays and Safety in DVE FY 2021 Accomplishments: Conducted advanced research in Displays and Safety in DVE.	4.000	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - Digital Engineering Demonstration FY 2021 Accomplishments: Conducted advanced research in Digital Engineering Demonstration.	8.000	-	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) BP8 / <i>Future Vertical Lift Air Platform Advanced Tech (CA)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
<i>Congressional Add:</i> Program Increase - Tethered UAS for All-Terrain Vehicles <i>FY 2021 Accomplishments:</i> Conducted advanced research in Tethered UAS for All-Terrain Vehicles.	12.500	-
Work executed by Army Futures Command.		
<i>Congressional Add:</i> 20MM Chaingun Development for FLRAA <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for 20MM Chaingun Development for FLRAA	-	8.000
<i>Congressional Add:</i> Air Launched Turbojet Missile <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Air Launched Turbojet Missile	-	15.000
<i>Congressional Add:</i> Composite Structures <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Composite Structures	-	5.000
<i>Congressional Add:</i> Data Refinement and Optimization for Aviation Sustainment <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Data Refinement and Optimization for Aviation Sustainment	-	4.500
<i>Congressional Add:</i> Degraded Visual Environment <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Degraded Visual Environment	-	3.500
<i>Congressional Add:</i> Digital Backbone <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Digital Backbone	-	5.000
<i>Congressional Add:</i> Elastomeric Imaging <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Elastomeric Imaging	-	3.000
<i>Congressional Add:</i> Fleetspace Maintenance Tool <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Fleetspace Maintenance Tool	-	4.500
<i>Congressional Add:</i> Platform Digitization and Maintenance <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Platform Digitization and Maintenance	-	5.000
<i>Congressional Add:</i> Stretch Broken Carbon Fiber	-	10.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) BP8 / <i>Future Vertical Lift Air Platform Advanced Tech (CA)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Stretch Broken Carbon Fiber		
<i>Congressional Add:</i> UAS Fuel Systems Enhancements	-	2.000
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided for UAS Fuel Systems Enhancements		
Congressional Adds Subtotals	68.750	82.500

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CA8 / <i>Adv Rotocraft Armaments Protection Sys</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CA8: <i>Adv Rotocraft Armaments Protection Sys</i>	-	0.963	1.234	2.862	-	2.862	9.551	12.617	12.621	12.618	0.000	52.466
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project investigates and demonstrates a holistic lethality solution for Future Vertical Lift (FVL) offensive and defensive applications, focused on but not limited to Future Long Range Assault Aircraft (FLRAA). Develop components for use in multi-role armament solutions for fire control, armament systems, munitions and integration of threat agnostic countermeasures.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Rotorcraft Armanents Protection System-Future Long Range Assault Aircraft	0.963	1.189	2.862
Description: This effort matures and demonstrates a holistic small caliber lethality solution for FVL offensive applications. Integrates and demonstrates components for use in multi-role armament solutions for fire control, software, and armament systems.			
FY 2022 Plans: Will mature designs for enhanced lethality with use of stabilization and holistic fire control in aviation platforms for gunner applications. Will mature architecture and interfaces in conformance with Future Airborne Capability Environment (FACE).			
FY 2023 Plans: Will mature use of holistic aviation fire control software, and demonstrate fire control architecture and interfaces in conformance with FACE. Will improve stabilized mount performance through sub-system level testing including modeling and simulation.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding increase reflects planned lifecycle of this effort in maturation of architecture and interfaces in conformance with FACE			
Title: FY2022 SBIR/STTR Transfer	-	0.045	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CA8 / <i>Adv Rotocraft Armaments Protection Sys</i>
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	0.963	1.234	2.862

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CC4 / <i>FVL Radar Advanced Technologies</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CC4: <i>FVL Radar Advanced Technologies</i>	-	3.207	4.000	3.342	-	3.342	4.384	-	2.369	2.369	0.000	19.671
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops Next Generation Reconfigurable Radar Aperture for detection, tracking and precision targeting, navigation and fire control for both reconnaissance, surveillance, and target acquisition (RSTA) and intelligence, surveillance and reconnaissance (ISR).

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Multi-mission Airborne Radar	3.207	3.854	3.342
Description: Advanced Digital radio frequency (RF) processing integration with final demonstration subsystem and system level radar hardware and software designs.			
FY 2022 Plans: Will leverage internal and joint partnerships to advance radar mode software development based upon the results of the system design review, market research and modeling and simulation efforts. Will develop advanced Airborne Moving Target Indicator mode, leveraging existing Air Force airborne search, scan, and track modes, to provide enhanced situational awareness and identification of airborne blue & red forces. Will develop Increment 1 Terrain Profiling radar mode.			
FY 2023 Plans: Will mature design component characteristics documented in both preliminary and critical design reviews. Component designs as well as system level capability verification will be completed via component modeling and simulation as well as bench top demonstration. Will demonstrate technology readiness level (TRL) 5 integrated components with a traditional tower test of radar modes.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CC4 / <i>FVL Radar Advanced Technologies</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding realigned to support PE 0603465A (Future Vertical Lift Advanced Technology) / Project CK2 (High Speed Maneuverable Missile (HSMM) Adv Tech).			
Title: FY2022 SBIR/STTR Transfer	-	0.146	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	3.207	4.000	3.342

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CG1 / <i>Holistic Team Survivability Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CG1: <i>Holistic Team Survivability Adv Tech</i>	-	-	6.424	11.898	-	11.898	15.272	17.290	21.124	24.753	0.000	96.761
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates increased Future Vertical Lift (FVL) Family of Systems Survivability (FoS) in an advanced integrated air defense systems environment through a multi-layered approach. The approach focuses on maturing and demonstrating technologies for reducing aircraft susceptibility and vulnerability during pre-mission planning, mission execution (combat survivability and safety), and post-mission repair and return to service.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Advanced Radio Frequency Countermeasures	-	6.189	6.789
<p>Description: This effort matures and demonstrates adaptive sensor and countermeasure technologies that provide platform protection against guided threats. It develops software and hardware to increase probability of detection and defeat of threats to aviation platforms using modeling and simulation (M&S), hardware in the loop (HIL) assessment, and field events. It provides integrated software and sensor technologies to counter the characteristics of advanced and agile threats.</p> <p>FY 2022 Plans: Will develop technical designs of electronics to support detect, decoy, and disrupt functions for Future Vertical Lift Platforms; will perform technical analysis of threat characteristics, analyze threat progression, and research new attack vectors to disrupt or degrade threat performance; will update technical models of electronics to analyze performance and determine technical specifications; will perform laboratory and field demonstrations of targeted payloads in critical technology areas.</p> <p>FY 2023 Plans: Will demonstrate Radio Frequency (RF) payload via flight demonstration against multiple threat surrogates, concluding in a technology readiness level (TRL) assessment of RF payload. Will further optimize RF payload for integration and test in the</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CG1 / <i>Holistic Team Survivability Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>prototype Air Launched Effect (ALE) platform. Algorithms to optimize payload and platform behaviors will be tested in modeling and simulation environments with previously developed electronic warfare (EW) models for advanced teaming integration.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Holistic End to End Survivability</p> <p>FY 2023 Plans: Will continue to expand Survivability Against integrated and Networked Threats, Survivability Correlator capabilities. Will begin development of Crashworthiness/Crash predictive capabilities. Will continue to develop and mature team based survivability architectures, behaviors and component technologies.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding for this effort is realigned in FY23 from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AK3 (Aviation Survivability Advanced Technology).</p>		-	-	5.109
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.235	-
Accomplishments/Planned Programs Subtotals		-	6.424	11.898
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CH6 / <i>Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH6: <i>Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech</i>	-	-	4.561	-	-	-	-	-	-	-	0.000	4.561
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project CV2/ Structures Platform Int: Resilience & Efficiency and Project CV1/ Control & Autonomy for Tactical Superiority Adv.

A. Mission Description and Budget Item Justification

This Project matures, and demonstrates advanced autonomy, controls, and structures technologies that provide manned/unmanned Future Vertical Lift (FVL) platforms the decisive tactical overmatch of near-peer adversaries needed for combat mission success. Matures and demonstrates modeling capabilities, control law development, and handling quality criteria required for fully realizing capabilities of advanced configurations of Army aircraft. Develops and demonstrates structures technologies and mission-adaptive autonomy (MAA) and control algorithms that provide level 1 handling qualities, resilience to extreme and hostile environments, damage-mitigation by reconfiguration of redundant controls, increased agility and speed with minimal fatigue, increased payload and weight efficiency, optional pilotage and manned-unmanned teaming capabilities, cognitive off-loading, and reduction of structural maintenance burden.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command.

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

	FY 2021	FY 2022	FY 2023
Title: Adaptive and Resilient Engineered Structures (ARES) Technology Demonstration	-	3.322	-
Description: Mature, integrate, and demonstrate advanced structures technologies providing performance, survivability, and sustainment benefits with broad applicability across platform scale and role, enabling mission success for manned/unmanned FVL platforms in the contested environment of multi-domain operations.			
FY 2022 Plans: Will mature and integrate advanced structures technologies that enable multi-domain operations performance, efficiency, survivability, and sustainment, and enhance extreme environment reliability and availability. Will mature and integrate			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CH6 / <i>Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
leveraged trade studies optimizing the synergy of applicable technologies including weight-saving, fatigue-tolerant, affordable, multifunctional, and damage-tolerant configurations for primary and secondary structure. FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CV2/ Structures Platform Int: Resilience & Efficiency.				
Title: Adaptive Tactical Autonomy and Control (ATAC) Technology Demonstration Description: Mature, integrate, and demonstrate advanced vehicle management, flight control, and autonomy technologies that enable FVL aircraft to achieve superior maneuverability and agility at all speeds, effectively exploit extreme/degraded environmental conditions as a force multiplier, fight and win in presence of failure or damage, and operate on a cognitive-loading-spectrum from piloted to fully autonomous. FY 2022 Plans: Will implement and demonstrate advanced flight control technologies and state-of-the-art autonomy algorithms on Army owned and operated flying laboratories to achieve Technology Readiness Level (TRL) 6. Will mature control strategies for seamless pilot interaction with scalable autonomy as needed for optionally piloted operations. Will demonstrate pilot interface technologies for enhanced situational awareness and optimal cognitive loading across the entire range of mission environments. Will mature high-speed extensions to handling qualities criteria for military rotorcraft including specialized response types and Mission Task Elements (MTE). FY 2022 to FY 2023 Increase/Decrease Statement: In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CV1/ Control & Autonomy for Tactical Superiority Adv.		-	1.072	-
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.167	-
Accomplishments/Planned Programs Subtotals		-	4.561	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CH6 / <i>Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CH7 / <i>Power & Thermal Management for FVL Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH7: <i>Power & Thermal Management for FVL Adv Tech</i>	-	-	3.402	4.396	-	4.396	4.275	5.418	7.513	5.392	0.000	30.396
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates at the system level, integrated electrical power technologies (including power generation, distribution, and control along with advanced energy storage) and thermal management technologies to provide significantly higher electrical power capability to Future Vertical Lift (FVL) aircraft while addressing consequential size, weight, pulsed power, and thermal issues. Provides power capability for advanced electric aeromechanical effectors, advanced mission systems that for example, execute algorithms for route planning and teaming, and for advanced survivability and electronic warfare capability. Will demonstrate software-in-the-loop performance of power & thermal management technologies to provide significantly higher electrical power capability to FVL aircraft while addressing consequential SWAP-C & thermal issues.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Optimized Energy for C5ISR Platforms Advanced Technology	-	1.845	2.043
Description: Enable advanced Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) and survivability systems on FVL platforms through component development of improved high power and energy storage technologies, higher capacity lower Size, Weight, and Power (SWaP) cooling systems, and more efficient electrical architectures			
FY 2022 Plans: Will improve performance of energy storage technologies to meet the SWaP requirements of target air platforms. Will mature the high resolution characterization of C5ISR devices such as advanced radars and sensors to demonstrate the ability for energy storage technologies to meet the electrical power demands of the system. Will demonstrate the effectiveness of integrating power management strategies for electrical sources when powering C5ISR devices. Will demonstrate intelligent controls for platform-integrated power systems.			
FY 2023 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CH7 / <i>Power & Thermal Management for FVL Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will optimize control schemes for electrical power systems to safely and effectively deliver power when and where it is needed on FVL aircraft. Will improve performance of energy storage systems through lighter packaging and improved controls. Will maximize energy and power density through use of hybrid schemes sized to support load demands.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
<p>Title: Power & Thermal Management Tech Demo</p> <p>Description: Exploits fabrication, and systems integration lab validation testing to Technical Readiness Level (TRL) 6 of power and thermal management technologies to provide significantly higher electrical power capability to FVL aircraft while addressing thermal issues and reducing system weight/volume</p> <p>FY 2022 Plans: Will perform design of power and thermal management system components to reduce Size, Weight, and Power (SWaP) of target platforms. Will perform design integration efforts to optimally incorporate advanced system components into a power and thermal management system, providing increased electrical power capability and reduced weight, volume, and cost to Future Vertical Lift aircraft.</p> <p>FY 2023 Plans: Will continue to mature the power and thermal management system components which includes design integration efforts to optimally incorporate advanced system components into a power and thermal management system, providing increased electrical power capability while reducing weight, volume, and cost to Future Vertical Lift aircraft and the enduring fleet. Will perform fabrication of advanced power and thermal management system components to be used in component level and system level validation efforts.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle glide path of this effort with ramp up of design and fabrication efforts in FY23.</p>		-	1.433	2.353
<p>Title: FY2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>		-	0.124	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CH7 / <i>Power & Thermal Management for FVL Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	3.402	4.396

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>				Project (Number/Name) CH8 / <i>UAS Survivability Adv Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH8: <i>UAS Survivability Adv Technology</i>	-	-	5.057	-	-	-	-	-	-	-	0.000	5.057
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to: Program Element (PE) 0603465A Future Vertical Lift Advanced Technology / Project AK3 Aviation Survivability Advanced Technology and to Project CG1 Holistic Team Survivability Adv Tech.

A. Mission Description and Budget Item Justification

This Project integrates the new technologies of Future Vertical Lift and Air Platform Technologies to address an evolving threat environment by improving Unmanned Aircraft System (UAS) survivability in contested environments. This is achieved without impacting UAS performance through tailored signature management for UAS missions, survivability-enhanced mission profiles, UAS survivability behaviors, resilient systems and architectures and electromagnetic (EM) vulnerability reduction. UAS Survivability Advanced Technology will mature UAS survivability technologies and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance.

This research supports Future Vertical Lift and Advanced Unmanned Aircraft Systems.

Research in this Project is fully coordinated with Program element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: UAS Survivability Demonstration	-	4.872	-
Description: This effort focuses on maturing UAS susceptibility and vulnerability reduction technologies to provide increased UAS survivability with minimum impacts to mission performance and UAS system cost and addresses the evolving threat environment to support the Maneuver Force within the Multi-Domain Battle concept. Will develop and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance, with objectives of tailored signature management for UAS missions, survivability-enhanced mission profiles, UAS survivability behaviors, resilient systems/architectures, and EM vulnerability reduction.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CH8 / <i>UAS Survivability Adv Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i> Will mature Unmanned Air Systems survivability components for demonstration; will perform data collection to verify technology functionality; will continue to develop, for demonstration Unmanned Air Systems survivability susceptibility and vulnerability reduction technologies; will develop/leverage candidate capabilities concepts for mission effectiveness analysis.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> In FY23, this effort is realigned to PE 0603465A, Project AK3 Aviation Survivability Advanced Technology and to Project CG1Holistic Team Survivability Adv Tech.</p>			
<p><i>Title:</i> FY2022 SBIR/STTR Transfer</p> <p><i>Description:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 Plans:</i> Funding transferred in accordance with Title 15 USC ?638</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638</p>	-	0.185	-
Accomplishments/Planned Programs Subtotals	-	5.057	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CJ5 / <i>Future Vertical Lift Medical Advanced Technology</i>
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CJ5: Future Vertical Lift Medical Advanced Technology</i>	-	-	-	1.031	-	1.031	1.295	1.553	1.554	1.554	0.000	6.987
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned from:
 Program Element (PE) 0602148A (Future Vertical Lift Technology)
 Project BZ7 (Future Vertical Lift Medical Technologies)

A. Mission Description and Budget Item Justification

This Project evaluates, validates, matures and delivers medical guidelines and strategies to assure optimal Soldier performance and protection on the future technologically-intensive battlefield. Key elements of the program include: 1) tailored medical selection and retention standards for Future Vertical Lift (FVL); 2) medical strategies to maintain and enhance human performance in Multi-domain operations (MDO); 3) human-centered technology design guidance to accommodate the range of aircrew; 4) improved protection standards to reduce FVL occupant injury; and 5) operator state monitoring tools to enable scalable autonomy in FVL aircraft.

Efforts in this Project further develop work done in Program Element 0602148A (Future Vertical Lift Technology) / Project BZ7 (Future Vertical Lift Medical Technologies).

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

	FY 2021	FY 2022	FY 2023
Title: Biomedical Strategies to Support Design and Operation of Future Vertical Lift (FVL) Aircraft	-	-	1.031
Description: This effort evaluates, validates, matures and delivers medical guidelines and strategies to assure optimal Soldier performance and protection on the future technologically-intensive battlefield. Key elements of the program include: 1) tailored medical selection and retention standards for FVL; 2) medical strategies to maintain and enhance human performance in MDO.; 3) human-centered technology design guidance to accommodate the range of aircrew; 4) improved protection standards to reduce FVL occupant injury; and 5) operator state monitoring tools to enable scalable autonomy in FVL aircraft.			
FY 2023 Plans: Will validate Health Hazard Assessment methods and criteria to protect FVL occupants from Head Supported Mass, impulsive noise/ shock, and repeated jolt to maintain FVL occupant performance and prevent injury. Will validate human variables for operator state assessment and mature a holistic aircrew workload/ performance stress model. Validate recommendations for			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / <i>Future Vertical Lift Advanced Technology</i>	Project (Number/Name) CJ5 / <i>Future Vertical Lift Medical Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Anthropomorphic Test Device (ATD) use in military environments. Validate revised spinal fracture thresholds and FVL aviator/crew seat requirements. Validate standards for assessing flight helmet stability and crash retention. <i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Increase in funding due to realignment from Program Element 0602148A (Future Vertical Lift Technology) / Project BZ7 (Future Vertical Lift Medical Technologies) to support advanced technology research in this topic area.				
Accomplishments/Planned Programs Subtotals		-	-	1.031
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology
--	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	173.244	145.826	11.147	-	11.147	9.715	9.603	4.766	3.329	0.000	357.630
AD1: High Energy Laser Tactical Vehicle Demo Adv Tech	-	26.247	26.089	-	-	-	-	-	-	-	0.000	52.336
AD4: Maneuver Air Defense Advanced Technology	-	16.937	19.737	-	-	-	-	-	-	-	0.000	36.674
AD6: Next Generation Fires Radar Advanced Technology	-	6.899	-	-	-	-	-	-	-	-	0.000	6.899
AE1: Close Combat High Energy Laser Advanced Technology	-	2.407	-	-	-	-	-	-	-	-	0.000	2.407
AE3: Unconventional Countermeasures-Survivability ATech	-	1.254	3.000	0.512	-	0.512	1.159	1.773	0.780	0.780	0.000	9.258
BN7: Weapons Components Adv Technology (CA)	-	119.500	97.000	-	-	-	-	-	-	-	0.000	216.500
CV6: Optimized High Energy Laser Source Adv Tech	-	-	-	7.112	-	7.112	5.505	4.157	-	-	0.000	16.774
DB3: Radar Survivability through Dis Sensing Adv Tech	-	-	-	3.523	-	3.523	3.051	3.673	3.986	2.549	0.000	16.782

Note

In Fiscal Year 2023 (FY23) Project CV6 (Optimized High Energy Laser Source Adv Tech) and Project DB3 (Radar Survivability through Dis Sensing Adv Tech) are New Start Projects.

A. Mission Description and Budget Item Justification

This Program Element (PE) matures demonstrates technology in support of Army Modernization Priority Air and Missile Defense by maturing, demonstrating and conducting system level experimentation for the development of advanced air defense technologies that reduce the cost curve of missile defense, restore overmatch, survive volley-fire attacks, and operate within sophisticated Anti-Access/Area Denial (A2/AD) and contested domains.

Research in this PE complements PE 0602150A (Air and Missile Defense Technology).

This PE is directly aligned to the Air & Missile Defense (AMD) Army Modernization Priority.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>
---	--

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

Research is performed by the United States (U.S.) Army Futures Command (AFC), the United States Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT), and the Engineer Research and Development Center (ERDC), and the United States Army Rapid Capabilities and Critical Technologies Office (RCCTO).

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	175.703	48.826	0.000	-	0.000
Current President's Budget	173.244	145.826	11.147	-	11.147
Total Adjustments	-2.459	97.000	11.147	-	11.147
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	97.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-2.459	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	11.147	-	11.147

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

Project: BN7: *Weapons Components Adv Technology (CA)*

Congressional Add: *Silicon Carbide Power Electronics Packaging*

Congressional Add: *Enterprise Science and Technology Demonstration Prototyping*

Congressional Add: *Program Increase*

Congressional Add: *HEL for All-Terrain Vehicles*

Congressional Add: *Program Increase - cUAS Integration with Robotic Vehicles*

Congressional Add: *Program Increase - Thermal Management System for High Energy Laser*

Congressional Add: *Program Increase - HEL Risk Reduction*

Congressional Add: *Program Increase - HEL System Characterization Lab*

Congressional Add: *Armored Combat Vehicle HEL Integration*

Congressional Add: *Missile Mentor*

	FY 2021	FY 2022
	8.000	-
	7.000	-
	20.000	-
	-	5.000
	5.000	-
	7.500	12.000
	50.000	46.000
	22.000	-
	-	11.000
	-	15.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>
---	--

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

Congressional Add: *Silicon Carbide Electronics*

Congressional Add Subtotals for Project: BN7

Congressional Add Totals for all Projects

	FY 2021	FY 2022
	-	8.000
	119.500	97.000
	119.500	97.000

Change Summary Explanation

FY23 funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology				Project (Number/Name) AD1 / High Energy Laser Tactical Vehicle Demo Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD1: High Energy Laser Tactical Vehicle Demo Adv Tech	-	26.247	26.089	-	-	-	-	-	-	-	0.000	52.336
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a greater than 100 kW-class mobile high energy laser (HEL) weapon system on a tactical platform to protect fixed and semi-fixed sites from rocket, artillery and mortar (RAM), unmanned aerial system (UAS), and advanced air defense threats. The major effort under this Project is the phased approach for mobile high power solid state laser (SSL) technology demonstrations that are traceable to the form, fit, and function requirements for a HEL weapon. This effort utilizes open systems architecture to ensure growth, interoperability, and opportunity for technology insertions for maturation of laser, beam control, sensor/radar, integration of power and thermal management subsystems, as well as Battle Management Command, Control, and Computers (BMC3).

Research in this Project complements Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AC9 (High Energy Laser Tactical Vehicle Demonstrator Te).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, and the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for directed energy.

Research is performed by the United States (US) Army Rapid Capabilities and Critical Technologies Office (RCCTO).

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

	FY 2021	FY 2022	FY 2023
Title: High Energy Laser Tactical Vehicle Demonstrator (HEL TVD) Advanced Technology	26.247	25.137	-
<p>Description: This effort integrates and demonstrates HEL technologies on an Army tactical platform for transition to the future Indirect Fire Protection Capability Increment 2-Intercept Program of Record. Effort includes integrating technologies developed under PE 0602307A/AC9 into HEL TVD and demonstrating the system against an array of RAM and UAS targets. Technology and knowledge gained from demonstration will be used to inform prototyping decisions by Army Rapid Capabilities and Critical Technologies Office and future material development decisions by Program Executive Office Missiles and Space.</p> <p>FY 2022 Plans: Will demonstrate a HEL-TVD system integration and a laboratory demonstration of a greater than 100kW laser weapon system for transition to the future Indirect Fire Protection Capability Program of Record.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) AD1 / <i>High Energy Laser Tactical Vehicle Demo Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Work in the High Energy Laser Tactical Vehicle Demonstrator (HEL TVD) Advanced Technology effort is realigned to PE 0604019A (Expanded Mission Area Missile (EMAM)) / Project BU9 (IFPC High Energy Laser) in FY23.			
Title: SBIR/STTR Transfer	-	0.952	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	26.247	26.089	-

C. Other Program Funding Summary (\$ in Millions) N/A
Remarks
D. Acquisition Strategy N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology			Project (Number/Name) AD4 / Maneuver Air Defense Advanced Technology				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD4: <i>Maneuver Air Defense Advanced Technology</i>	-	16.937	19.737	-	-	-	-	-	-	-	0.000	36.674
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is Terminated in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities. Matures and demonstrates key missile technologies for an affordable short range interceptor to defeat advanced Maneuver-Short Range Air Defense (M-SHORAD) threats (e.g. Rotary Wing, Fixed Wing, Tactical / Lethal Unmanned Aerial Systems, and Subsonic Cruise Missile.

Research in this Project complements Program Element (PE) 0602150A (Air and Missile Defense Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Maneuver Air Defense Advanced Technology	16.937	19.016	-
Description: Mature and demonstrate missile technologies and components necessary for an affordable short range air defense interceptor capability to defeat Rotary Wing, Fixed Wing, Tactical / Lethal Unmanned Aerial System, and cruise missile threats.			
FY 2022 Plans: Will continue integration of an interceptor Control Test Vehicle (CTV), then will conduct a CTV flight test to demonstrate expected control, navigation, and mid-course guidance performance; will complete Guidance Test Vehicle (GTV) Integration in a dynamic Hardware-in-the-loop (HWIL) environment to verify performance of all major Guidance Electronics Unit (GEU) and control subsystems prior to GTV flight test.			
FY 2022 to FY 2023 Increase/Decrease Statement: This effort Terminates in FY23.			
Title: FY2022 SBIR/STTR Transfer	-	0.721	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) AD4 / <i>Maneuver Air Defense Advanced Technology</i>
--	--	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	16.937	19.737	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology	Project (Number/Name) AD6 / Next Generation Fires Radar Advanced Technology
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD6: Next Generation Fires Radar Advanced Technology	-	6.899	-	-	-	-	-	-	-	-	0.000	6.899
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities by demonstrating scalable radar open systems architecture software allowing the insertion of modular software components.

Research in this Project complements Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AD5 (Next Generation Fires Radar Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation Fires Radar Advanced Technology	6.899	-	-
Description: This effort matures and demonstrates the architectures, processing and components necessary to deliver next generation capability, flexibility and supportability to the fires family of radar systems. Efforts focus on development of a modular and scalable open architecture that is extensible to multiple radar systems technologies in support of air defense and fixed- and semi-fixed site protection.			
Accomplishments/Planned Programs Subtotals	6.899	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology			Project (Number/Name) AE1 / Close Combat High Energy Laser Advanced Technology				
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AE1: Close Combat High Energy Laser Advanced Technology	-	2.407	-	-	-	-	-	-	-	-	0.000	2.407
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies for compact, highly efficient lasers, and compact beam control for close-combat platforms. This Project investigates and develops advanced technologies for High Energy Laser (HEL) weapon systems to enable more efficient laser systems with greater power output, which in-turn enables laser weapons on smaller platforms for additional missions. This includes technologies to support development of alternate laser sources, precision optical pointing and tracking components, adaptive optics to overcome laser degradation due to atmospheric effects, more compact and lighter weight energy generation and storage devices, and more efficient thermal management systems to remove excess heat.

Research in this Project complements Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AD9 (Close Combat High Energy Laser Technology).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, and the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for directed energy.

Research is performed by the United States (US) Army Rapid Capabilities and Critical Technologies Office (RCCTO).

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

	FY 2021	FY 2022	FY 2023
Title: Close Combat High Energy Laser Advanced Technology	2.407	-	-
Description: This effort develops laser and beam control technologies with extremely low size, weight, and power (SWaP) requirements enabling high energy lasers in smaller, close combat platforms. Extremely low SWaP laser systems will expand the laser weapons mission set. Reduction in SWaP also benefits higher power systems on the large tactical vehicles to counter the current threat set as well as laser-hardened threats more quickly or at longer ranges.			
Accomplishments/Planned Programs Subtotals	2.407	-	-

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

N/A

Remarks

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) AE1 / <i>Close Combat High Energy Laser Advanced Technology</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology				Project (Number/Name) AE3 / Unconventional Countermeasures-Survivability ATech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AE3: Unconventional Countermeasures-Survivability ATech	-	1.254	3.000	0.512	-	0.512	1.159	1.773	0.780	0.780	0.000	9.258
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies to increase survivability of personnel and critical assets using integrated unconventional countermeasures. These countermeasures include tone down concepts for signature management using novel materials, rapidly deployable, low-cost, multispectral survivability enhancement technologies as well as intuitive decision support technologies to select and assess non-kinetic protective measures.

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

Research in this Project is conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project complements Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AE2 (Unconventional Countermeasures-Survivability Tech).

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

	FY 2021	FY 2022	FY 2023
Title: Development of Unconventional Countermeasures for Enhanced Survivability (DeUCES) Demonstrations	0.970	2.652	-
Description: This effort matures and demonstrates countermeasures to detect and defeat near-peer advanced weapons through computational simulations and physical countermeasures and enhanced tonedown measures.			
FY 2022 Plans: Demonstrate integrated unconventional countermeasure solutions and optimize their design and employment in fixed and semi-fixed Air and Missile Defense assets, and document best practices for employment.			
FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort completing in Fiscal Year 2022.			
Title: Applications of Environmentally-Inspired Unconventional Countermeasures	0.284	0.238	-
Description: This effort matures and demonstrates rapidly-deployable, eco-friendly materials with spectral signatures that alter or obscure underlying target spectral signatures.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology	Project (Number/Name) AE3 / Unconventional Countermeasures-Survivability ATech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans: Make use of modeling and simulation tools to optimize countermeasure spectral feature selection matching for specific operating environments.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort completing in Fiscal Year 2022.</p>				
<p>Title: Advanced Integrated Unconventional Countermeasures Applications Demonstrations</p> <p>Description: This effort demonstrates methods and materials to defeat peer advanced reconnaissance, surveillance, targeting methods through advancements in material science and computational prototyping to reduce targetable signatures and confuse targeting systems.</p> <p>FY 2023 Plans: Will demonstrate a system incorporating organic materials for targeting hyperspectral and multispectral sensor bands. And demonstrate advanced thermal generation technologies for lightweight structural panels for integration into survivability enhancement systems.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects the planned lifecycle for this Project to provide for application of advancements in material science and computational prototyping.</p>		-	-	0.512
<p>Title: FY 2022 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.110	-
Accomplishments/Planned Programs Subtotals		1.254	3.000	0.512
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) AE3 / <i>Unconventional Countermeasures-Survivability ATech</i>

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology				Project (Number/Name) BN7 / Weapons Components Advanced Technology (CA)			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BN7: Weapons Components Advanced Technology (CA)	-	119.500	97.000	-	-	-	-	-	-	-	0.000	216.500
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
Congressional Interest Item funding provided for Weapons Components Advanced Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Weapons Components Advanced Technology.

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 2021	FY 2022
Congressional Add: Silicon Carbide Power Electronics Packaging	8.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Silicon Carbide Power Electronics Packaging. Work executed under the direction of the Army Futures Command.		
Congressional Add: Enterprise Science and Technology Demonstration Prototyping	7.000	-
FY 2021 Accomplishments: Program Increase supported advanced research on Enterprise Science and Technology Demonstration Prototyping. Work executed under the direction of the Army Futures Command.		
Congressional Add: Program Increase	20.000	-
FY 2021 Accomplishments: Program increase supporting advanced technology development of High Energy Laser Systems. This effort has performed research and development on advanced weapons technology leading to a high energy laser system for vehicles supporting Army Brigade and below operations. It further addressed Size, Weight, and Power/Cost (SWaP-C) and target requirements for enhanced capabilities of current directed energy		

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) BN7 / <i>Weapons Components Advanced Technology (CA)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	
<p>prototyping efforts. The effort builds upon the advanced laser technologies being developed and integrated on larger vehicles.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p> <p>Congressional Add: HEL for All-Terrain Vehicles</p> <p>FY 2022 Plans: Program increase supporting advanced technology development of high energy lasers for all-terrain vehicles.</p> <p>Furthers efforts executed under FY 2021 \$20M congressional add Program Increase.</p> <p>This project will perform research and development on coherently combined phased array high energy laser advanced weapons technology to support the mobile Counter-small Unmanned Aircraft Systems (C-sUAS) efforts at Army Brigade and below operations. The effort matures current Joint C-sUAS Office supported efforts and will perform graded field demonstrations against relevant targets.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p> <p>Congressional Add: Program Increase - cUAS Integration with Robotic Vehicles</p> <p>FY 2021 Accomplishments: Program increase supporting advanced technology development of Counter-Small Unmanned Aerial Systems Integration with Robotic Vehicles.</p> <p>This effort supports the integration of proven Commercial-Off-The-Shelf (COTS) technologies to provide a modular multi-mission capability to include surveillance (with small Unmanned Aerial Systems (sUAS) detection), Counter-sUAS (C-sUAS) electronic warfare & other hard kill capabilities including High Energy Laser (HEL). This effort will produce a single integrated prototype system delivered and demonstrated in support of an initial demonstration.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p> <p>Congressional Add: Program Increase - Thermal Management System for High Energy Laser</p> <p>FY 2021 Accomplishments: Program increase supporting advanced technology development of thermal management systems for high energy lasers.</p>	-	5.000	
	5.000	-	
	7.500	12.000	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) BN7 / <i>Weapons Components Advanced Technology (CA)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022
<p>This effort improves laser diode fiber amplifier cooling with smaller, lighter and more energy efficient thermal management technology. Recent developments in parallel Army programs has proven that novel phase change materials, coordinative complex compound sorption technology, and integrated combinations with vector-drive vapor compression technology, can dramatically reduce size, weight and power (SWaP) of directed energy weapons systems.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p> <p>FY 2022 Plans: Congressional Interest Item funding provided for Thermal Management System for 10KW to 50KW Lasers Program increase supporting advanced technology development of thermal management systems for high energy lasers.</p> <p>This project will improve laser diode fiber amplifier cooling with smaller, lighter and more energy efficient thermal management technology and demonstrate that capability in a relevant environment. This effort continues work in phase change materials and vapor compression technologies to reducing the size, weight, power, and cost of direct energy weapons technologies.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p>			
<p>Congressional Add: Program Increase - HEL Risk Reduction</p> <p>FY 2021 Accomplishments: Program increase supporting advanced technology development of High Energy Laser Risk Reduction.</p> <p>The Indirect Fire Protection Capability-High Energy Laser (IFPC-HEL) pre-prototype demonstrator proves out a 300 kW HEL system in a laboratory by the end of FY2022. This effort accelerates subsystem development and integration of HEL, Beam Control System (BCS), Beam Director Assembly (BDA), and power and thermal technologies. Integration of these subsystems into an enclosure and onto the platform for range / field demonstrations. Enabling final verification of the system against its defined threat portfolio, and providing a potential path forward for follow-on prototype systems delivery to the Warfighter as residual combat capability.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p> <p>FY 2022 Plans: Congressional Interest Item funding provided for IFPC HEL Risk Reduction Program increase supporting advanced technology development of High Energy Laser Risk Reduction.</p>		50.000	46.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology	Project (Number/Name) BN7 / Weapons Components Advanced Technology (CA)
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<p>The Indirect Fire Protection Capability-High Energy Laser (IFPC-HEL) pre-prototype demonstrator proves out a 300 kW HEL system in a laboratory by the end of FY 2022. This effort supports the post laboratory demonstration system integration of all subsystems into an enclosure and onto the platform for range / field demonstrations to enable final verification of the system against its defined threat portfolio and potential path forward for follow-on prototype systems to be delivered to the warfighter as residual combat capability.</p> <p>Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.</p>		
<p>Congressional Add: Program Increase - HEL System Characterization Lab</p> <p>FY 2021 Accomplishments: Program increase supporting advanced technology development of high energy laser systems characterization lab.</p> <p>This effort has worked to develop the equipment and instrumentation for a directed energy Systems Characterization Lab (SCL), integrate SCL equipment within High Energy Laser (HEL) lab, and create a capability for government validation of Science & Technology (S&T) performance and testing of HEL prototypes and weapons.</p> <p>Additionally, developed government owned surrogate HEL weapon subsystem performance evaluation frameworks necessary for the stimulation, test, and assessment of new HEL components and subsystems.</p> <p>Finally, this effort is developing laboratory instrumentation to measure HEL Weapon Systems, components, or subsystems.</p> <p>Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.</p>	22.000	-
<p>Congressional Add: Armored Combat Vehicle HEL Integration</p> <p>FY 2022 Plans: Program increase supporting advanced technology development of armored combat vehicle high energy laser integration.</p> <p>This project will provide a system representative high energy laser asset to independently characterize and score Direct Energy systems to validate weapon effectiveness as part of developmental and operational testing, as well as Outside Continental United States (OCONUS) operational assessments. This effort will inform</p>	-	11.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology	Project (Number/Name) BN7 / Weapons Components Advanced Technology (CA)
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
engagement tactics against threat representative Unmanned Aircraft Systems (UAS) and UAS swarms. Enables Rapid Capabilities and Critical Technologies Office (RCCTO) test events for counter UAS activities. Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.		
Congressional Add: Missile Mentor <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Missile Mentor	-	15.000
Congressional Add: Silicon Carbide Electronics <i>FY 2022 Plans:</i> Congressional Interest Item funding provided for Silicon Carbide Electronics	-	8.000
Congressional Adds Subtotals	119.500	97.000

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

Remarks

D. Acquisition Strategy
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology				Project (Number/Name) CV6 / Optimized High Energy Laser Source Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CV6: Optimized High Energy Laser Source Adv Tech	-	-	-	7.112	-	7.112	5.505	4.157	-	-	0.000	16.774
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

A. Mission Description and Budget Item Justification

This Project matures and demonstrates Optimized High Energy Laser Source advanced technology establishing a more affordable laser source for application in High Energy Laser weapon systems. This Project will deliver a lower cost laser weapon source and leverages prior laser source development work to ruggedize and integrate for transition into the Maneuver-Short Range Air Defense Program of Record.

Research in this Project compliments other Army Directed Energy efforts conducted under Program Element (PE) 0602150A (Air and Missile Defense Technology) and PE 0603466A (Air and Missile Defense Advanced Technology).

The cited research is consistent with the Army's 31+4 programs, the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for Directed Energy.

Research is performed by the United States Army Space and Missile Defense Command - Technical Center (USASMDC-TC).

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

	FY 2021	FY 2022	FY 2023
Title: Optimized High Energy Laser Source Advanced Technology	-	-	7.112
Description: This effort matures and demonstrates Optimized High Energy Laser Source Advanced Technology to demonstrate a more affordable laser source for application in High Energy Laser weapon systems. This effort will provide a low-cost, rugged and compact laser source. Delivering an affordable direct replacement 50 kW-class laser subsystem with 50% efficiency and 80% fractional Power in the Bucket enabling improvements in efficiency and Size, Weight, and Power laser source resulting in a smaller footprint while reducing logistics requirements.			
FY 2023 Plans: This effort will design and integrate a 50 kW class semiconductor high energy laser subsystem module by leveraging commercially available single mode laser diodes. This effort builds on current industry capabilities that utilize spectral beam			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) CV6 / <i>Optimized High Energy Laser Source Adv Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
combining of multimode diode lasers for manufacturing capabilities. Current research efforts in the Army that have proven this concept is feasible will be leveraged in this effort. FY 2022 to FY 2023 Increase/Decrease Statement: This is a New Start Project in FY23.				
Accomplishments/Planned Programs Subtotals		-	-	7.112
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603466A / Air and Missile Defense Advanced Technology				Project (Number/Name) DB3 / Radar Survivability through Dis Sensing Adv Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DB3: Radar Survivability through Dis Sensing Adv Tech	-	-	-	3.523	-	3.523	3.051	3.673	3.986	2.549	0.000	16.782
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2023.

A. Mission Description and Budget Item Justification

This Project matures, and demonstrates critical radar capability enhancements to defeat advanced Air and Missile threats and protect Army maneuver forces and critical assets. Radar enhancements are required for advanced Electronic Protection (EP) techniques against advanced jammers, electronic Combat Identification (CID), and resource optimization across the threat spectrum while retaining 360 degree coverage capability. Technology maturation in the project includes providing capabilities for: dispersed multi-static operation, classifying/tracking emerging threats and high volume threats; adaptive digital beam forming to enable resource efficiency, performance in a dynamic clutter environment and enhanced survivability in a contested battlespace; and multi-modal tracking and additional discrimination models to support diverse and emerging threats, such as swarms and guided munitions. Multiple soldier touchpoints and demonstrations of developed technology to autonomously synchronize multiple radars across a distributed battlefield in the presence of countermeasures and the denial of Global Positioning System (GPS) will be performed in lab and field environments.

This research is coordinated with Army Program Element (PE) 0602141A (Lethality Technology) / Project CG4 (Advanced Radar Concepts and Technologies); PE 0602148A (Future Vertical Lift Technology) / Project CC3 (FVL Radar Technologies); PE 0602150A (Air and Missile Defense Technology) / Project AD5 (Next Generation Fires Radar Technology); and PE 0601102A (Defense Research Sciences) / Project AA8 (Sensing and Electromagnetics).

This Research complements Program Element (PE) 0602141A (Lethality Technology) / Project CJ7 (Future Air Defense Missile Enabling Tech) and PE 0602150A (Air and Missile Defense Technology) / Project DA9 (Radar Survivability through Dis Sensing Tech).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Radar Survivability through Dis Sensing (RSDS) Adv Tech	-	-	3.523
Description: Matures, and demonstrates critical radar capability enhancements to defeat advanced Air and Missile threats and protect Army maneuver forces and critical assets.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603466A / <i>Air and Missile Defense Advanced Technology</i>	Project (Number/Name) DB3 / <i>Radar Survivability through Dis Sensing Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p><i>FY 2023 Plans:</i> Will mature RSDS software and evaluate utilizing high fidelity simulations representative of current and future Army Air Defense radars. Will begin to generate test concepts and demonstration plans for multi-static radar operations.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> This is a new start effort, initiated as high priority critical effort to mature and demonstrate radar capability enhancements to defeat advanced Air and Missile threats and protect Army maneuver forces and critical assets.</p>			
Accomplishments/Planned Programs Subtotals	-	-	3.523

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603920A / <i>Humanitarian Demining</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	16.690	19.000	8.933	-	8.933	9.028	9.201	9.297	9.294	0.000	81.443
CD5: <i>Humanitarian Demining</i>	-	16.690	19.000	8.933	-	8.933	9.028	9.201	9.297	9.294	0.000	81.443

A. Mission Description and Budget Item Justification

This Program Element (PE) develops, demonstrates and validates cost-effective technologies for use in humanitarian demining via Outside Continental United States (OCONUS) operational field evaluations. This PE's low-cost and highly effective technology reduces the landmine and unexploded ordnance (UXO) / improvised explosive device (IED) threat to deployed United States (US) forces and the local population. This PE coordinates with the Department of State's Weapons Removal and Abatement Program, the Department of Defense (DoD) Humanitarian Mine Action (HMA) programs of the Combatant Commands (CCMDs), and international mine action organizations and foreign militaries. New technology requirements and areas of emphasis are identified and validated at annual Requirements Workshop and UXO/IED Working Group Meetings. Technology investments are prioritized using the results of these meetings and CCMD security cooperation and theater campaign plan HMA objectives. This PE advances the state-of-the-art of demining technologies and evaluates these technologies utilizing host nation humanitarian demining partners.

This PE supports and bolsters the CCMD stability operations mission as directed under Department of Defense Instruction (DODI) 3000.05 to foster mil-to-mil engagement, and bolster economic security and development with partner nations worldwide. Additionally, this PE fosters nations' mine action capacity while improving DoD's visibility and access, generating long-term positive perceptions of DoD and the US, and fostering collaborative relationships with host nation governments. It also directly supports the National Defense Strategy through ensuring common domains remain open and free.

This PE utilizes a research and development plan based on operational test data gained through Operational Field Evaluations (OFEs). These OFEs provide this PE a unique capability to collect this data against live mines/UXO in actual minefields around the world. This data is unavailable to any other DoD organization. This OFE data drives future humanitarian demining investment decisions and is shared and leveraged by the U.S. Army's Army Futures Command programs to further improve U.S. forces' technologies. In addition, this PE provides mine and UXO detector training to the CCMDs at the Humanitarian Demining Training Center (HDTC) in support of Military to Military training and partnerships. Since 1995 the program has fielded technologies for 234 evaluations in 43 countries, including Afghanistan, Angola, Cambodia, Colombia, Iraq, Kosovo, Ukraine, and Vietnam. This program's technologies have cleared 71.2 million square meters of the world's toughest minefields, and found or destroyed 213,220 mines and UXO.

This PE supports the DoD's strategic guidance to address instability and reduce the demand for significant US force commitments to stability operations; with DOD) 3000.05 (Stability Operations) and Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3207.01C (Department of Defense Support to Humanitarian Mine Action) to reduce the social, economic and environmental impact of landmines and unexploded ordnance.

This PE will be executed by the Army Futures Command (AFC).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603920A / <i>Humanitarian Demining</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	16.690	8.649	0.000	-	0.000
Current President's Budget	16.690	19.000	8.933	-	8.933
Total Adjustments	0.000	10.351	8.933	-	8.933
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.351			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	8.933	-	8.933

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

Project: CD5: *Humanitarian Demining*

Congressional Add: *Program Increase*

	FY 2021	FY 2022
Congressional Add Subtotals for Project: CD5	8.485	10.351
Congressional Add Totals for all Projects	8.485	10.351

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603920A / Humanitarian Demining				Project (Number/Name) CD5 / Humanitarian Demining			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CD5: Humanitarian Demining	-	16.690	19.000	8.933	-	8.933	9.028	9.201	9.297	9.294	0.000	81.443
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops, demonstrates and validates cost-effective technologies for use in humanitarian demining via Outside Continental United States (OCONUS) operational field evaluations. This Project's low-cost and highly effective technology reduces the landmine and unexploded ordnance (UXO) / improvised explosive device (IED) threat to deployed United States (US) forces and the local population. This Project coordinates with the Department of State's Weapons Removal and Abatement Program, the Department of Defense (DoD) Humanitarian Mine Action (HMA) programs of the Combatant Commands (CCMDs), and international mine action organizations and foreign militaries. New technology requirements and areas of emphasis are identified and validated at annual Requirements Workshop and UXO/IED Working Group Meetings. Technology investments are prioritized using the results of these meetings and CCMD security cooperation and theater campaign plan HMA objectives. This Project advances the state-of-the-art of demining technologies and evaluates these technologies utilizing host nation humanitarian demining partners.

This Project supports and bolsters the CCMD stability operations mission as directed under Department of Defense Instruction (DODI) 3000.05 to foster mil-to-mil engagement, and bolster economic security and development with partner nations worldwide. Additionally, this Project fosters nations' mine action capacity while improving DoD's visibility and access, generating long-term positive perceptions of DoD and the US, and fostering collaborative relationships with host nation governments. It also directly supports the National Defense Strategy through ensuring common domains remain open and free.

This Project utilizes a research and development plan based on operational test data gained through Operational Field Evaluations (OFEs). These OFEs provide this Project a unique capability to collect this data against live mines/UXO in actual minefields around the world. This data is unavailable to any other DoD organization. This OFE data drives future humanitarian demining investment decisions and is shared and leveraged by the U.S. Army's Army Futures Command programs to further improve U.S. forces' technologies. In addition, this Project provides mine and UXO detector training to the CCMDs at the Humanitarian Demining Training Center (HDTTC) in support of Military to Military training and partnerships. Since 1995 the program has fielded technologies for 234 evaluations in 43 countries, including Afghanistan, Angola, Cambodia, Colombia, Iraq, Kosovo, Ukraine, and Vietnam. This program's technologies have cleared 71.2 million square meters of the world's toughest minefields, and found or destroyed 213,220 mines and UXO.

This Project supports the DoD's strategic guidance to address instability and reduce the demand for significant US force commitments to stability operations; with DOD 3000.05 (Stability Operations) and Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3207.01C (Department of Defense Support to Humanitarian Mine Action) to reduce the social, economic and environmental impact of landmines and unexploded ordnance.

This Project will be executed by the Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Humanitarian Demining Technologies	8.205	8.333	8.933

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603920A / Humanitarian Demining	Project (Number/Name) CD5 / Humanitarian Demining
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
---	----------------	----------------	----------------

Description: This effort adapts commercial-off-the-shelf equipment, integrates mature technologies, and leverages research and development activity within the Army, particularly the AFC CCDC Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, and Reconnaissance (C5ISR) Tactical Countermining mission area. This effort supports the DoD HMA programs of the CCMDs and aims to improve existing technologies for mine/UXO detection, technical survey/area reduction, mechanical mine/UXO clearance, vegetation clearance, and mechanical mine neutralization.

FY 2022 Plans:
Will identify, develop, and assess new technologies that provide individual mine/UXO detection, mechanical mine/UXO and vegetation clearance, and mechanical mine neutralization. Will demonstrate emerging mine/UXO defeat technologies and capabilities in relevant environments. Will execute threat surveys and country assessments. Will execute HD R&D requirements workshop to define global technology needs for humanitarian mine action. Will continue the ongoing successful operational evaluations from FY21.

FY 2023 Plans:
Will develop and mature technologies to improve mine/UXO detection, vegetation clearance, and mechanical mine neutralization capabilities. Will demonstrate and validate emerging mine/UXO defeat technologies and capabilities in live threat environments. Will continue execution of threat surveys and site assessments. Will execute annual HD R&D requirements workshop to define global technology needs for humanitarian mine action. Will continue the ongoing successful operational evaluations from FY22.

FY 2022 to FY 2023 Increase/Decrease Statement:
Funding change reflects planned lifecycle of this effort.

Title: FY2022 SBIR/STTR Transfer	-	0.316	-
---	---	-------	---

Description: Funding transferred in accordance with Title 15 USC ?638

FY 2022 Plans:
Funding transferred in accordance with Title 15 USC ?638

FY 2022 to FY 2023 Increase/Decrease Statement:
Funding transferred in accordance with Title 15 USC ?638

Accomplishments/Planned Programs Subtotals	8.205	8.649	8.933
---	-------	-------	-------

Congressional Add: Program Increase

FY 2021 Accomplishments: Program Increase supported advanced research on Humanitarian Demining Technologies.

	FY 2021	FY 2022
	8.485	10.351

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603920A / <i>Humanitarian Demining</i>	Project (Number/Name) CD5 / <i>Humanitarian Demining</i>
--	--	--

	FY 2021	FY 2022
Work executed by Army Futures Command.		
<i>FY 2022 Plans:</i> Congressional Interest Item funding provided		
Congressional Adds Subtotals	8.485	10.351

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

N/A

Remarks

D. Acquisition Strategy

N/A