Department of Defense
Fiscal Year (FY) 2021 Budget Estimates

February 2020

Army

Justification Book of

Research, Development, Test & Evaluation, Army

RDT&E − Volume II, Budget Activity 4

Table of Contents

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, $12,770,165,000.00 to remain available for obligation until September 30, 2022.

COST STATEMENT

The following Justification Books were prepared at a cost of $460,861: 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 6, Budget Activity 7, and Budget Activity 8.

FY 2021 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 2020.

2. Relationship of the FY 2021 Budget Submitted to Congress to the FY 2020 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:

Budget Activity	***OSDPE / Project***	***Project Title***
02	0602115A / EB2	HIV Biomedical Technology
02	0602134A / CD2	Counter Improvised-Threat Advanced Studies
02	0602146A / AQ2	EW Techniques Technology
02	0602146A / AQ7	High Tempo Data Driven Decision Tools Technology
03	0603002A / MP3	Phys Chem Toxicity Assessment Sys Adv Tech
03	0603115A / EB3	HIV Medical Development
03	0603134A / CD3	Counter Improvised-Threat Simulation
03	0603463A / AQ8	High Tempo Data Driven Decision Tools Adv Tech
03	0603463A / AR8	Sensing in Contested Environments Adv Tech
03	0603463A / AU2	Optimization of Geospatial Data for Visualization
03	0603463A / AV1	GEOInt/Ops Logistics Integration-Planning Adv Tech
03	0603463A / AW6	Modular GPS Independent Sensors Advanced Tech
03	0603920A / CD5	Humanitarian Demining
04	0603804A / EW8	Armored Engineer Vehicles
04	0604115A / AX3	Technology Maturation Initiatives

04	0604134A / CD4	Counter Improvised-Threat Demonstration
05	0304270A / FJ5	Terrestrial Layer System (MIP)
05	0604601A / S64	Common Remotely Operated Wpn Sys (CROWS)
05	0604604A / BX8	Cold Weather All-Terrain Vehicle (CATV)
05	0604622A / E50	TRAILER DEVELOPMENT
05	0604802A / XT2	40mm Door Breach
05	0605145A / CD6	Medical Products and Support Systems Development
06	0605801A / M23	US Army Corps of Engineers Base Operations
06	0606105A / CD7	Medical Program-Wide Activities
07	0203802A / VV2	TOW
07	0607145A / FD5	Apache Product Improvement
07	0203802A / VT9	Lethal Miniature Aerial Missile System (LMAMS)

Program Element/Project Restructures:

Budget Activity	***Old OSDPE / Project: Title***	***New OSDPE / Project***
02	0602141A / AH5: Projectile and Multi-Function Warhead Technologies	0602143A/AY6, 0602145A/BK5
02	0602143A / AN1: Narrowband SATCOM Technology	0602146A/BZ6, 060346A/AN2
02	0602143A / BE1: Support Technology to Mission Command	0602146A/AQ9
02	0602144A / BL4: Countermine Technology	0602145A/BF9
02	0602145A / BH2: C4ISR Modular Autonomy Technology	0602145A/BF9
02	0602145A / BH7: Enhanced VETRONICS Technology	0602145A/BH5
02	0602145A / BJ3: Hydrogen Based Combat System Technology	0602145A/BH5
02	0602145A / BJ7: Detection of Explosive Hazards Technology	0602145A/BF9
02	0602146A / AN3: Non Traditional Waveforms Technology	0603463A/AP6
02	0602146A / AV7: Atmospheric Modeling and Meterological Technology	0603772A/101
02	0602147A / AF5: Simulation and Aerostructures Technology	0602147A/AE7
02	0602147A / AF6: Structures Technology	0602147A/AE7
02	0602147A / AF7: Warhead Integration Technology	0602147A/AE7

02	0602147A / AF9: Precision and Accuracy Technology	0602147A/AE7
02	0602147A / AG1: Missile Electronics Technology	0602147A/AE7
02	0602147A / AG2: Information and Signal Processing Technology	0602147A/AE7
02	0602147A / AG8: Advanced Energetics Technology	0602141A/AH9
02	0602147A / AG9: Multiple Simul Engagement Technologies (MSET) Tech	0602148A/AK4
02	0602148A / AI7: Alternative Concept Engine Technology	0602148A/AM4
02	0602148A / AK1: UAS Survivability Technology	0603465A/AK3
02	0602148A / AK6: Advanced Rotorcraft Armaments Protection System Te	0603465A/AK7, 0633465A/CA8
02	0602148A / AM2: Aircraft and Aircrew Protection Technology	0602148A/AJ4
02	0602150A / AD7: Missile Fire Control Sensors Technology	0602150A/AD3
02	0602787A / 874: Cbt Casualty Care Tech	0602787A/MM4
03	0603002A / MG4: Tech Base/Enabling Res in Mil Occup Med Adv Tech	0603002A/MN7, MN9, MO3, MO8, MP3
03	0603002A / MM5: Tech Base/Enabling Res Combat Cas Care Adv Tech	0603002A/MN3, MN4, MN5, MO2, MO4, MO7
03	0603002A / MM9: Tech Base/Enabling Rsrch for Infect Dis Adv Tech	0603002A/MO9, 0602787A/MM8
03	0603002A / MN8: Drugs to Prevent and Treat Malaria Advanced Tech	0602787A/MM8
03	0603002A / MO3: Military Occupational Fitness Standards Adv Tech	0603002A/MN7
03	0603118A / AZ8: Soldier Squad Small Arms Armaments Adv Tech	0602143/AY8, 0603463A/AQ1
03	0603462A / BH3: C4ISR Modular Autonomy Advanced Technology	0603462A/BZ9
03	0603462A / BI1: Protection for Autonomous Systems Adv Tech	0603462A/BG7
03	0603462A / BJ6: Hydrogen Based Combat System Advanced Technology	0603462A/BH6
03	0603462A / BJ8: Detection of Explosive Hazards Advanced Technology	0602145A/BF9
03	0603463A / AR2: Energy Informed Operations Advanced Technology	0603465A/AM5
03	0603463A / AU6: Automated Analytics for Operational Environment AT	0602146/AT7
03	0603464A / AF4: Missile Simulation Advanced Technology	0602147/AF8
03	0603464A / AH3: Single Multi-mission Attack Missile Adv Tech	0603465A/AK5
03	0603464A / BS3: Strategic Missile Advanced Technology	0603464A/BY2
03	0603465A / AI6: Next Gen Tactical UAS TD Advanced Technology	0603465A
03	0603465A / AM3: Aircraft and Aircrew Protection Advanced Tech	0603465A/AJ5
03	0603466A / AC8: Low Cost Extended Range Air Defense Adv Tech	0603466A/AD4
04	1206120A / FJ8: Assured Positioning, Navigation and Timing (PNT)	0604120A/ED5, BV4

04	1206120A / FJ9: Dismounted A-PNT	0604120A/EH8
04	1206120A / FK2: Mounted A-PNT	0604120A/EJ2
04	1206120A / FK3: Anti-Jam Antenna	0604120A/EJ2
04	1206308A / FE5: Space And Missile Defense Integration	0603308A/990
04	0603639A / EB8: OWL for Small Caliber Ammunition	0604802A/EP4
04	0603639A / EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	0604802A/FL4
04	0603639A / EU3: .50 Caliber All-Purpose Tactical Cartridge (APTC)	0604802A/EU5
04	0604541A / BT1: Interoperability	0604541A/BT3, BT5
04	0604541A / BT4: Network Technology Maturation Initiatives (NTMI)	0604541A/BT5
05	0604798A / DY3: NIE Test & Evaluation	0604798A/DY7
05	0604798A / DZ6: Army Integration Management & Coordination	0605054A/FL7
06	0605326A / 33B: Soldier-Centered Analyses For Future Force	0605604A/675
07	1203142A / FE1: Dscs-Dcs (Phase II)	0303142A/253
07	1203142A / FE2: MILSATCOM System Engineering	0303142A/456
07	1203142A / FI8: Protected Anti-JAM Tactical SATCOM	0303142A/456
07	1208053A / FE7: Joint Tact Grd Station-P3I(MIP)	0208053A/635
07	0303028A / FG2: Counterintelligence & Human Intel Modernization	0607150A/BS5
07	0303028A / H13: Information Dominance Center (IDC) - Tiara	0607150A/BS5
07	0305232A / RA7: RQ-11 Raven (MIP)	0604101A/BR6, 0605205A/BR7

Program Terminations (including transfers to Procurement and Sustainment):

Budget Activity	***OSDPE / Project***	***Project Title***
02	0602146A / AN5	Protected SATCOM-WB Global SATCOM Inter Canc Tech
02	0602146A / AU5	Automated Analytics for Operational Environment
02	0602146A / AW5	Modular GPS Independent Sensors Technology
02	0602147A / AH2	Single Multi-mission Attack Missile (SMAM) Technol
02	0602213A / CY9	Decoy and Deterrence Technology
02	0602787A / VB4	System Biology And Network Science Technology
03	0603457A / 7CY	Decoy and Deterrence Advanced Technology

03	0603462A / BF5	Adv Lethality & Accuracy Sys for Med Cal Adv Tech
03	0603463A / AW2	Autonomous Navigation Advanced Technology
03	0603464A / AE6	Strategic Long Range Cannon Advanced Technology
03	0603465A / AI4	Joint Multi-Role (JMR) Demonstration Advanced Tech
03	0603465A / AL6	Degraded Vis Environ Mitigation (DVE-M) Adv Tech
04	1206120A / FK1	PSEUDOLITES
04	0603804A / G11	Adv Elec Energy Con Ad
04	0604115A / AX8	Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)
04	0604644A / MR1	Mobile Intermediate Range Missile
05	0604201A / EW7	Degraded Visual Environment
05	0604601A / FI2	Lightweight 30mm Cannon
05	0604710A / L76	Dismounted Fire Support Laser Targeting Systems
05	0604802A / ED7	Advanced Multipurpose (AMP) Cartridge
05	0604802A / EU7	Enhanced Lethality Cannon Munitions
05	0604804A / FG4	Ultra-Lightweight Camouflage Net System (ULCANS)
05	0604804A / L43	ENGINEER SUPPORT EQUIPMENT - ED
05	0604827A / S65	Platoon Power Generator
05	0604852A / XU9	Active Protection System
05	0604854A / 509	LIGHTWEIGHT 155M HOWITZER
05	0605013A / 193	Medical Communications For Combat Casualty
05	0605013A / XV6	Army Leader Dashboard
05	0605029A / EQ2	IntegGrdSecSurvRespC(IGSSR-C)
05	0605034A / EQ4	Tactical Security System (TSS)
05	0605036A / EQ5	Combating Weapons of Mass Destruction (CWMD)
05	0605049A / XT4	Advanced Threat Detection System (ATDS)
05	0605053A / FB2	Man Transportable Robotic System (MTRS) Inc II
05	0605053A / FB9	MTRS Standardization
06	0605805A / 857	DoD Explosives Safety Standards
06	0606001A / FD4	Military Ground-Based CREW Technology
07	0303150A / C86	Army Global C2 System

07	0305233A / RQ7	RQ-7 Shadow UAV
07	0307665A / FL5	Next Gen Biometric Collection Capability (MIP)
07	0607138A / ES5	Fixed Wing Product Improvement Program
07	0607665A / DT2	Non-MIP Biometrics

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.

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

Appropriation	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
Research, Development, Test & Eval, Army	11,371,268	12,543,435		147,304	12,690,739
Total Research, Development, Test & Evaluation	11,371,268	12,543,435		147,304	12,690,739

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

Appropriation	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
Research, Development, Test & Eval, Army	12,587,343		182,824	182,824	12,770,167
Total Research, Development, Test & Evaluation	12,587,343		182,824	182,824	12,770,167

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

Summary Recap of Budget Activities	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
Basic Research	491,263	574,484			574,484
Applied Research	1,553,764	1,259,374			1,259,374
Advanced Technology Development	1,561,576	1,531,516			1,531,516
Advanced Component Development & Prototypes	1,213,569	2,975,681		11,114	2,986,795
System Development & Demonstration	3,119,552	2,989,779		100,147	3,089,926
Management Support	1,710,179	1,368,475		1,875	1,370,350
Operational Systems Development	1,721,365	1,844,126		34,168	1,878,294
Software and Digital Technology Pilot Programs					
Total Research, Development, Test & Evaluation	11,371,268	12,543,435		147,304	12,690,739
Summary Recap of FYDP Programs					
General Purpose Forces	646,373	765,324			765,324
Intelligence and Communications	311,699	236,563		37,368	273,931
Research and Development	10,090,836	11,139,975		109,936	11,249,911
Central Supply and Maintenance	106,766	108,348			108,348
Administration and Associated Activities	358				
Space	209,281	285,952			285,952
Classified Programs	5,955	7,273			7,273
Total Research, Development, Test & Evaluation	11,371,268	12,543,435		147,304	12,690,739

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
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17 Jan 2020

Summary Recap of Budget Activities	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
Basic Research	463,359				463,359
Applied Research	920,881		2,000	2,000	922,881
Advanced Technology Development	1,203,590				1,203,590
Advanced Component Development & Prototypes	3,421,608		2,520	2,520	3,424,128
System Development & Demonstration	3,199,798		97,825	97,825	3,297,623
Management Support	1,333,123		5,137	5,137	1,338,260
Operational Systems Development	1,998,539		75,342	75,342	2,073,881
Software and Digital Technology Pilot Programs	46,445				46,445
Total Research, Development, Test & Evaluation	12,587,343		182,824	182,824	12,770,167
Summary Recap of FYDP Programs					
General Purpose Forces	923,370		2,300	2,300	925,670
Intelligence and Communications	309,698		76,942	76,942	386,640
Research and Development	11,289,280		103,582	103,582	11,392,862
Central Supply and Maintenance	61,012				61,012
Administration and Associated Activities					
Space					
Classified Programs	3,983				3,983
Total Research, Development, Test & Evaluation	12,587,343		182,824	182,824	12,770,167

R-1 21PB: FY 2021 President's Budget (Published Version), as of January 17, 2020 at 11:58:58

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FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
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(Dollars in Thousands)

17 Jan 2020

Summary Recap of Budget Activities	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
Basic Research	491,263	574,484			574,484
Applied Research	1,553,764	1,259,374			1,259,374
Advanced Technology Development	1,561,576	1,531,516			1,531,516
Advanced Component Development & Prototypes	1,213,569	2,975,681		11,114	2,986,795
System Development & Demonstration	3,119,552	2,989,779		100,147	3,089,926
Management Support	1,710,179	1,368,475		1,875	1,370,350
Operational Systems Development	1,721,365	1,844,126		34,168	1,878,294
Software and Digital Technology Pilot Programs					
Total Research, Development, Test & Evaluation	11,371,268	12,543,435		147,304	12,690,739
Summary Recap of FYDP Programs					
General Purpose Forces	646,373	765,324			765,324
Intelligence and Communications	311,699	236,563		37,368	273,931
Research and Development	10,090,836	11,139,975		109,936	11,249,911
Central Supply and Maintenance	106,766	108,348			108,348
Administration and Associated Activities	358				
Space	209,281	285,952			285,952
Classified Programs	5,955	7,273			7,273
Total Research, Development, Test & Evaluation	11,371,268	12,543,435		147,304	12,690,739

Department of the Army
FY 2021President's Budget
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Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

Summary Recap of Budget Activities	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
Basic Research	463,359				463,359
Applied Research	920,881		2,000	2,000	922,881
Advanced Technology Development	1,203,590				1,203,590
Advanced Component Development & Prototypes	3,421,608		2,520	2,520	3,424,128
System Development & Demonstration	3,199,798		97,825	97,825	3,297,623
Management Support	1,333,123		5,137	5,137	1,338,260
Operational Systems Development	1,998,539		75,342	75,342	2,073,881
Software and Digital Technology Pilot Programs	46,445				46,445
Total Research, Development, Test & Evaluation	12,587,343		182,824	182,824	12,770,167
Summary Recap of FYDP Programs					
General Purpose Forces	923,370		2,300	2,300	925,670
Intelligence and Communications	309,698		76,942	76,942	386,640
Research and Development	11,289,280		103,582	103,582	11,392,862
Central Supply and Maintenance	61,012				61,012
Administration and Associated Activities					
Space					
Classified Programs	3,983				3,983
Total Research, Development, Test & Evaluation	12,587,343		182,824	182,824	12,770,167

R-1 21PB: FY 2021 President's Budget (Published Version), as of January 17, 2020 at 11:58:58

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)	Sec
1	0601101A	In-House Laboratory Independent Research	01	11,391					U
2	0601102A	Defense Research Sciences	01	306,347	354,480			354,480	U
3	0601103A	University Research Initiatives	01	62,813	87,858			87,858	U
4	0601104A	University and Industry Research Centers	01	110,712	127,164			127,164	U
5	0601121A	Cyber Collaborative Research Alliance	01		4,982			4,982	U
	Basic Research			491,263	574,484			574,484	
6	0602105A	Materials Technology	02	79,432					U
7	0602115A	Biomedical Technology	02						U
8	0602120A	Sensors and Electronic Survivability	02	90,023					U
9	0602122A	TRACTOR HIP	02	8,674					U
10	0602126A	TRACTOR JACK	02	400					U
11	0602134A	Counter Improvised-Threat Advanced Studies	02						U
12	0602141A	Lethality Technology	02		69,961			69,961	U
13	0602142A	Army Applied Research	02		30,819			30,819	U
14	0602143A	Soldier Lethality Technology	02		145,900			145,900	U
15	0602144A	Ground Technology	02		143,899			143,899	U
16	0602145A	Next Generation Combat Vehicle Technology	02		263,547			263,547	U
17	0602146A	Network C3I Technology	02		138,016			138,016	U

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Sec
1	0601101A	In-House Laboratory Independent Research	01						U
2	0601102A	Defense Research Sciences	01	303,257				303,257	U
3	0601103A	University Research Initiatives	01	67,148				67,148	U
4	0601104A	University and Industry Research Centers	01	87,877				87,877	U
5	0601121A	Cyber Collaborative Research Alliance	01	5,077				5,077	U
	Basic Research			463,359				463,359	
6	0602105A	Materials Technology	02						U
7	0602115A	Biomedical Technology	02	11,835				11,835	U
8	0602120A	Sensors and Electronic Survivability	02						U
9	0602122A	TRACTOR HIP	02						U
10	0602126A	TRACTOR JACK	02						U
11	0602134A	Counter Improvised-Threat Advanced Studies	02	2,000				2,000	U
12	0602141A	Lethality Technology	02	42,425				42,425	U
13	0602142A	Army Applied Research	02	30,757				30,757	U
14	0602143A	Soldier Lethality Technology	02	125,435				125,435	U
15	0602144A	Ground Technology	02	28,047				28,047	U
16	0602145A	Next Generation Combat Vehicle Technology	02	217,565		2,000	2,000	219,565	U
17	0602146A	Network C3I Technology	02	114,404				114,404	U

Department of the Army
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Appropriation: 2040A Research, Development, Test & Eval, Army

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)	Sec
18	0602147A	Long Range Precision Fires Technology	02		120,327			120,327	U
19	0602148A	Future Verticle Lift Technology	02		98,359			98,359	U
20	0602150A	Air and Missile Defense Technology	02		95,771			95,771	U
21	0602211A	Aviation Technology	02	80,424					U
22	0602213A	C3I Applied Cyber	02		18,947			18,947	U
23	0602270A	Electronic Warfare Technology	02	25,127					U
24	0602303A	Missile Technology	02	90,496					U
25	0602307A	Advanced Weapons Technology	02	43,454					U
26	0602308A	Advanced Concepts and Simulation	02	28,623					U
27	0602601A	Combat Vehicle and Automotive Technology	02	102,899					U
28	0602618A	Ballistics Technology	02	86,737					U
29	0602622A	Chemical, Smoke and Equipment Defeating Technology	02	4,884					U
30	0602623A	Joint Service Small Arms Program	02	11,890					U
31	0602624A	Weapons and Munitions Technology	02	379,833					U
32	0602705A	Electronics and Electronic Devices	02	98,855					U
33	0602709A	Night Vision Technology	02	33,218					U
34	0602712A	Countermine Systems	02	26,594					U
35	0602716A	Human Factors Engineering Technology	02	23,755					U
36	0602720A	Environmental Quality Technology	02	15,364					U

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Sec
18	0602147A	Long Range Precision Fires Technology	02	60,553				60,553	U
19	0602148A	Future Verticle Lift Technology	02	96,484				96,484	U
20	0602150A	Air and Missile Defense Technology	02	56,298				56,298	U
21	0602211A	Aviation Technology	02						U
22	0602213A	C3I Applied Cyber	02	18,816				18,816	U
23	0602270A	Electronic Warfare Technology	02						U
24	0602303A	Missile Technology	02						U
25	0602307A	Advanced Weapons Technology	02						U
26	0602308A	Advanced Concepts and Simulation	02						U
27	0602601A	Combat Vehicle and Automotive Technology	02						U
28	0602618A	Ballistics Technology	02						U
29	0602622A	Chemical, Smoke and Equipment Defeating Technology	02						U
30	0602623A	Joint Service Small Arms Program	02						U
31	0602624A	Weapons and Munitions Technology	02						U
32	0602705A	Electronics and Electronic Devices	02						U
33	0602709A	Night Vision Technology	02						U
34	0602712A	Countermine Systems	02						U
35	0602716A	Human Factors Engineering Technology	02						U
36	0602720A	Environmental Quality Technology	02						U

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37	0602782A	Command, Control, Communications Technology	02	51,685					U
38	0602783A	Computer and Software Technology	02	14,622					U
39	0602784A	Military Engineering Technology	02	96,922					U
40	0602785A	Manpower/Personnel/Training Technology	02	17,157	20,873			20,873	U
41	0602786A	Warfighter Technology	02	55,467					U
42	0602787A	Medical Technology	02	87,229	112,955			112,955	U
		Applied Research		1,553,764	1,259,374			1,259,374	
43	0603001A	Warfighter Advanced Technology	03	40,501					U
44	0603002A	Medical Advanced Technology	03	94,575	83,030			83,030	U
45	0603003A	Aviation Advanced Technology	03	165,035					U
46	0603004A	Weapons and Munitions Advanced Technology	03	240,862					U
47	0603005A	Combat Vehicle and Automotive Advanced Technology	03	171,448					U
48	0603006A	Space Application Advanced Technology	03	48,542					U
49	0603007A	Manpower, Personnel and Training Advanced Technology	03	6,270	11,038			11,038	U
50	0603009A	TRACTOR HIKE	03	22,631					U
51	0603015A	Next Generation Training & Simulation Systems	03	27,711					U
52	0603115A	Medical Development	03						U

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37	0602782A	Command, Control, Communications Technology	02						U
38	0602783A	Computer and Software Technology	02						U
39	0602784A	Military Engineering Technology	02						U
40	0602785A	Manpower/Personnel/Training Technology	02	20,766				20,766	U
41	0602786A	Warfighter Technology	02						U
42	0602787A	Medical Technology	02	95,496				95,496	U
		Applied Research		920,881		2,000	2,000	922,881	
43	0603001A	Warfighter Advanced Technology	03						U
44	0603002A	Medical Advanced Technology	03	38,896				38,896	U
45	0603003A	Aviation Advanced Technology	03						U
46	0603004A	Weapons and Munitions Advanced Technology	03						U
47	0603005A	Combat Vehicle and Automotive Advanced Technology	03						U
48	0603006A	Space Application Advanced Technology	03						U
49	0603007A	Manpower, Personnel and Training Advanced Technology	03	11,659				11,659	U
50	0603009A	TRACTOR HIKE	03						U
51	0603015A	Next Generation Training & Simulation Systems	03						U
52	0603115A	Medical Development	03	27,723				27,723	U

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53	0603117A	Army Advanced Technology Development	03		66,338			66,338	U
54	0603118A	Soldier Lethality Advanced Technology	03		135,968			135,968	U
55	0603119A	Ground Advanced Technology	03		136,793			136,793	U
56	0603125A	Combating Terrorism - Technology Development	03	43,910					U
57	0603130A	TRACTOR NAIL	03	4,896					U
58	0603131A	TRACTOR EGGS	03	6,041					U
59	0603134A	Counter Improvised-Threat Simulation	03						U
60	0603270A	Electronic Warfare Technology	03	40,461					U
61	0603313A	Missile and Rocket Advanced Technology	03	92,404					U
62	0603322A	TRACTOR CAGE	03	16,845					U
63	0603457A	C3I Cyber Advanced Development	03		23,769			23,769	U
64	0603461A	High Performance Computing Modernization Program	03	211,457	224,755			224,755	U
65	0603462A	Next Generation Combat Vehicle Advanced Technology	03		260,535			260,535	U
66	0603463A	Network C3I Advanced Technology	03		142,899			142,899	U
67	0603464A	Long Range Precision Fires Advanced Technology	03		189,386			189,386	U
68	0603465A	Future Vertical Lift Advanced Technology	03		174,892			174,892	U

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53	0603117A	Army Advanced Technology Development	03	62,663				62,663	U
54	0603118A	Soldier Lethality Advanced Technology	03	109,608				109,608	U
55	0603119A	Ground Advanced Technology	03	14,795				14,795	U
56	0603125A	Combating Terrorism - Technology Development	03						U
57	0603130A	TRACTOR NAIL	03						U
58	0603131A	TRACTOR EGGS	03						U
59	0603134A	Counter Improvised-Threat Simulation	03	25,000				25,000	U
60	0603270A	Electronic Warfare Technology	03						U
61	0603313A	Missile and Rocket Advanced Technology	03						U
62	0603322A	TRACTOR CAGE	03						U
63	0603457A	C3I Cyber Advanced Development	03	23,357				23,357	U
64	0603461A	High Performance Computing Modernization Program	03	188,024				188,024	U
65	0603462A	Next Generation Combat Vehicle Advanced Technology	03	199,358				199,358	U
66	0603463A	Network C3I Advanced Technology	03	158,608				158,608	U
67	0603464A	Long Range Precision Fires Advanced Technology	03	121,060				121,060	U
68	0603465A	Future Vertical Lift Advanced Technology	03	156,194				156,194	U

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69	0603466A	Air and Missile Defense Advanced Technology	03		82,113			82,113	U
70	0603606A	Landmine Warfare and Barrier Advanced Technology	03	16,860					U
71	0603607A	Joint Service Small Arms Program	03	22,628					U
72	0603710A	Night Vision Advanced Technology	03	69,094					U
73	0603728A	Environmental Quality Technology Demonstrations	03	28,079					U
74	0603734A	Military Engineering Advanced Technology	03	100,359					U
75	0603772A	Advanced Tactical Computer Science and Sensor Technology	03	45,799					U
76	0603794A	C3 Advanced Technology	03	45,168					U
77	0603920A	Humanitarian Demining	03						U
		Advanced Technology Development		1,561,576	1,531,516			1,531,516	
78	0603305A	Army Missle Defense Systems Integration	04	60,301	59,487			59,487	U
79	0603308A	Army Space Systems Integration	04						U
80	0603327A	Air and Missile Defense Systems Engineering	04	44,743	52,480		500	52,980	U
81	0603619A	Landmine Warfare and Barrier - Adv Dev	04	40,255	82,915			82,915	U
82	0603627A	Smoke, Obscurant and Target Defeating Sys-Adv Dev	04	19,852					U
83	0603639A	Tank and Medium Caliber Ammunition	04	40,358	77,696			77,696	U

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69	0603466A	Air and Missile Defense Advanced Technology	03	58,130				58,130	U
70	0603606A	Landmine Warfare and Barrier Advanced Technology	03						U
71	0603607A	Joint Service Small Arms Program	03						U
72	0603710A	Night Vision Advanced Technology	03						U
73	0603728A	Environmental Quality Technology Demonstrations	03						U
74	0603734A	Military Engineering Advanced Technology	03						U
75	0603772A	Advanced Tactical Computer Science and Sensor Technology	03						U
76	0603794A	C3 Advanced Technology	03						U
77	0603920A	Humanitarian Demining	03	8,515				8,515	U
		Advanced Technology Development		1,203,590				1,203,590	
78	0603305A	Army Missle Defense Systems Integration	04	11,062				11,062	U
79	0603308A	Army Space Systems Integration	04	26,230				26,230	U
80	0603327A	Air and Missile Defense Systems Engineering	04	26,482		500	500	26,982	U
81	0603619A	Landmine Warfare and Barrier - Adv Dev	04	64,092				64,092	U
82	0603627A	Smoke, Obscurant and Target Defeating Sys-Adv Dev	04						U
83	0603639A	Tank and Medium Caliber Ammunition	04	92,753				92,753	U

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84	0603645A	Armored System Modernization - Adv Dev	04	80,106	144,234			144,234	U
85	0603747A	Soldier Support and Survivability	04	8,067	6,514		3,000	9,514	U
86	0603766A	Tactical Electronic Surveillance System - Adv Dev	04	35,667	37,490			37,490	U
87	0603774A	Night Vision Systems Advanced Development	04	7,072	200,791			200,791	U
88	0603779A	Environmental Quality Technology - Dem/Val	04	14,190	19,561			19,561	U
89	0603790A	NATO Research and Development	04	3,564	5,406			5,406	U
90	0603801A	Aviation - Adv Dev	04	93,885	505,890			505,890	U
91	0603804A	Logistics and Engineer Equipment - Adv Dev	04	18,845	6,254		1,085	7,339	U
92	0603807A	Medical Systems - Adv Dev	04	38,371	36,975			36,975	U
93	0603827A	Soldier Systems - Advanced Development	04	30,384	26,113			26,113	U
94	0604017A	Robotics Development	04	70,745	84,381			84,381	U
95	0604020A	Cross Functional Team (CFT) Advanced Development & Prototyping	04	8,225					U
96	0604021A	Electronic Warfare Technology Maturation (MIP)	04		23,043			23,043	U
97	0604035A	Low Earth Orbit (LEO) Satellite Capability	04						U
98	0604100A	Analysis Of Alternatives	04	9,396	10,023			10,023	U

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84	0603645A	Armored System Modernization - Adv Dev	04	151,478				151,478	U
85	0603747A	Soldier Support and Survivability	04	5,841				5,841	U
86	0603766A	Tactical Electronic Surveillance System - Adv Dev	04	194,775				194,775	U
87	0603774A	Night Vision Systems Advanced Development	04	24,316				24,316	U
88	0603779A	Environmental Quality Technology - Dem/Val	04	13,387				13,387	U
89	0603790A	NATO Research and Development	04	4,762				4,762	U
90	0603801A	Aviation - Adv Dev	04	647,937				647,937	U
91	0603804A	Logistics and Engineer Equipment - Adv Dev	04	4,761				4,761	U
92	0603807A	Medical Systems - Adv Dev	04	28,520				28,520	U
93	0603827A	Soldier Systems - Advanced Development	04	26,138				26,138	U
94	0604017A	Robotics Development	04	121,207				121,207	U
95	0604020A	Cross Functional Team (CFT) Advanced Development & Prototyping	04						U
96	0604021A	Electronic Warfare Technology Maturation (MIP)	04	22,840				22,840	U
97	0604035A	Low Earth Orbit (LEO) Satellite Capability	04	22,678				22,678	U
98	0604100A	Analysis Of Alternatives	04	10,082				10,082	U

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99	0604101A	Small Unmanned Aerial Vehicle (SUAV) (6.4)	04						U
100	0604113A	Future Tactical Unmanned Aircraft System (FTUAS)	04	12,393	40,745			40,745	U
101	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor	04	84,981	379,772			379,772	U
102	0604115A	Technology Maturation Initiatives	04	91,749	179,676			179,676	U
103	0604117A	Maneuver - Short Range Air Defense (M-SHORAD)	04	75,711	42,900			42,900	U
104	0604118A	TRACTOR BEAM	04	52,894					U
105	0604119A	Army Advanced Component Development & Prototyping	04		112,806		4,529	117,335	U
106	0604120A	Assured Positioning, Navigation and Timing (PNT)	04						U
107	0604121A	Synthetic Training Environment Refinement & Prototyping	04	39,890	103,621			103,621	U
108	0604134A	Counter Improvised-Threat Demonstration, Prototype Development, and Testing	04						U
109	0604182A	Hypersonics	04		404,000			404,000	U
110	0604319A	Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)	04	10,324					U
111	0604403A	Future Interceptor	04		2,000			2,000	U
112	0604541A	Unified Network Transport	04		29,700			29,700	U
113	0604644A	Mobile Medium Range Missile	04		5,000			5,000	U

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99	0604101A	Small Unmanned Aerial Vehicle (SUAV) (6.4)	04	1,378				1,378	U
100	0604113A	Future Tactical Unmanned Aircraft System (FTUAS)	04	40,083				40,083	U
101	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor	04	376,373				376,373	U
102	0604115A	Technology Maturation Initiatives	04	156,834				156,834	U
103	0604117A	Maneuver - Short Range Air Defense (M-SHORAD)	04	4,995				4,995	U
104	0604118A	TRACTOR BEAM	04						U
105	0604119A	Army Advanced Component Development & Prototyping	04	170,490				170,490	U
106	0604120A	Assured Positioning, Navigation and Timing (PNT)	04	128,125				128,125	U
107	0604121A	Synthetic Training Environment Refinement & Prototyping	04	129,547				129,547	U
108	0604134A	Counter Improvised-Threat Demonstration, Prototype Development, and Testing	04	13,831				13,831	U
109	0604182A	Hypersonics	04	801,417				801,417	U
110	0604319A	Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)	04						U
111	0604403A	Future Interceptor	04	7,992				7,992	U
112	0604541A	Unified Network Transport	04	40,677				40,677	U
113	0604644A	Mobile Medium Range Missile	04						U

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114	0604785A	Integrated Base Defense (Budget Activity 4)	04				2,000	2,000	U
115	0305251A	Cyberspace Operations Forces and Force Support	04	52,817	52,102			52,102	U
116	1206120A	Assured Positioning, Navigation and Timing (PNT)	04	123,364	139,110			139,110	U
117	1206308A	Army Space Systems Integration	04	45,420	104,996			104,996	U
		Advanced Component Development & Prototypes		1,213,569	2,975,681		11,114	2,986,795	
118	0604201A	Aircraft Avionics	05	31,401	8,414			8,414	U
119	0604270A	Electronic Warfare Development	05	56,310	59,539			59,539	U
120	0604328A	TRACTOR CAGE	05	27,050					U
121	0604601A	Infantry Support Weapons	05	74,629	87,179			87,179	U
122	0604604A	Medium Tactical Vehicles	05	3,905					U
123	0604611A	JAVELIN	05	5,250	14,997			14,997	U
124	0604622A	Family of Heavy Tactical Vehicles	05	11,182	13,125			13,125	U
125	0604633A	Air Traffic Control	05	11,580	5,781			5,781	U
126	0604642A	Light Tactical Wheeled Vehicles	05	1,013	2,965			2,965	U
127	0604645A	Armored Systems Modernization (ASM) - Eng Dev	05	359,017	285,136			285,136	U
128	0604710A	Night Vision Systems - Eng Dev	05	139,337	143,696			143,696	U
129	0604713A	Combat Feeding, Clothing, and Equipment	05	4,393	7,393			7,393	U

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114	0604785A	Integrated Base Defense (Budget Activity 4)	04			2,020	2,020	2,020	U
115	0305251A	Cyberspace Operations Forces and Force Support	04	50,525				50,525	U
116	1206120A	Assured Positioning, Navigation and Timing (PNT)	04						U
117	1206308A	Army Space Systems Integration	04						U
		Advanced Component Development & Prototypes		3,421,608		2,520	2,520	3,424,128	
118	0604201A	Aircraft Avionics	05	2,764				2,764	U
119	0604270A	Electronic Warfare Development	05	62,426				62,426	U
120	0604328A	TRACTOR CAGE	05						U
121	0604601A	Infantry Support Weapons	05	91,574				91,574	U
122	0604604A	Medium Tactical Vehicles	05	8,523				8,523	U
123	0604611A	JAVELIN	05	7,493				7,493	U
124	0604622A	Family of Heavy Tactical Vehicles	05	24,792				24,792	U
125	0604633A	Air Traffic Control	05	3,511				3,511	U
126	0604642A	Light Tactical Wheeled Vehicles	05	1,976				1,976	U
127	0604645A	Armored Systems Modernization (ASM) - Eng Dev	05	135,488				135,488	U
128	0604710A	Night Vision Systems - Eng Dev	05	61,445				61,445	U
129	0604713A	Combat Feeding, Clothing, and Equipment	05	2,814				2,814	U

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130	0604715A	Non-System Training Devices - Eng Dev	05	42,604	30,912			30,912	U
131	0604741A	Air Defense Command, Control and Intelligence - Eng Dev	05	208,965	33,502			33,502	U
132	0604742A	Constructive Simulation Systems Development	05	21,354	11,636			11,636	U
133	0604746A	Automatic Test Equipment Development	05	10,104	10,915			10,915	U
134	0604760A	Distributive Interactive Simulations (DIS) - Eng Dev	05	8,423	7,801			7,801	U
135	0604768A	Brilliant Anti-Armor Submunition (BAT)	05	6,568	20,000			20,000	U
136	0604780A	Combined Arms Tactical Trainer (CATT) Core	05	20,514	9,241			9,241	U
137	0604798A	Brigade Analysis, Integration and Evaluation	05	48,030	38,303			38,303	U
138	0604802A	Weapons and Munitions - Eng Dev	05	173,713	186,323			186,323	U
139	0604804A	Logistics and Engineer Equipment - Eng Dev	05	70,096	107,826			107,826	U
140	0604805A	Command, Control, Communications Systems - Eng Dev	05	15,366	12,595			12,595	U
141	0604807A	Medical Materiel/Medical Biological Defense Equipment - Eng Dev	05	45,054	48,264			48,264	U
142	0604808A	Landmine Warfare/Barrier - Eng Dev	05	39,261	37,108			37,108	U
143	0604818A	Army Tactical Command & Control Hardware & Software	05	163,229	129,974			129,974	U
144	0604820A	Radar Development	05	37,847	95,720			95,720	U

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130	0604715A	Non-System Training Devices - Eng Dev	05	28,036				28,036	U
131	0604741A	Air Defense Command, Control and Intelligence - Eng Dev	05	43,651		27,000	27,000	70,651	U
132	0604742A	Constructive Simulation Systems Development	05	10,150				10,150	U
133	0604746A	Automatic Test Equipment Development	05	5,578				5,578	U
134	0604760A	Distributive Interactive Simulations (DIS) - Eng Dev	05	7,892				7,892	U
135	0604768A	Brilliant Anti-Armor Submunition (BAT)	05	24,975				24,975	U
136	0604780A	Combined Arms Tactical Trainer (CATT) Core	05	3,568				3,568	U
137	0604798A	Brigade Analysis, Integration and Evaluation	05	19,268				19,268	U
138	0604802A	Weapons and Munitions - Eng Dev	05	265,811				265,811	U
139	0604804A	Logistics and Engineer Equipment - Eng Dev	05	49,694				49,694	U
140	0604805A	Command, Control, Communications Systems - Eng Dev	05	11,079				11,079	U
141	0604807A	Medical Materiel/Medical Biological Defense Equipment - Eng Dev	05	49,870				49,870	U
142	0604808A	Landmine Warfare/Barrier - Eng Dev	05	9,589				9,589	U
143	0604818A	Army Tactical Command & Control Hardware & Software	05	162,513				162,513	U
144	0604820A	Radar Development	05	109,259				109,259	U

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145	0604822A	General Fund Enterprise Business System (GFEBS)	05	35,468	42,883			42,883	U
146	0604823A	Firefinder	05	25,856	17,294			17,294	U
147	0604827A	Soldier Systems - Warrior Dem/Val	05	10,044	4,803			4,803	U
148	0604852A	Suite of Survivability Enhancement Systems - EMD	05	50,380	85,198			85,198	U
149	0604854A	Artillery Systems - EMD	05	1,722	10,732			10,732	U
150	0605013A	Information Technology Development	05	74,551	88,689			88,689	U
151	0605018A	Integrated Personnel and Pay System-Army (IPPS-A)	05	158,807	102,073			102,073	U
152	0605028A	Armored Multi-Purpose Vehicle (AMPV)	05	107,521	83,830			83,830	U
153	0605029A	Integrated Ground Security Surveillance Response Capability (IGSSR-C)	05	3,104	6,699			6,699	U
154	0605030A	Joint Tactical Network Center (JTNC)	05	15,287	15,882			15,882	U
155	0605031A	Joint Tactical Network (JTN)	05	42,134	40,808			40,808	U
156	0605032A	TRACTOR TIRE	05	107,926					U
157	0605033A	Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)	05	4,980	3,847			3,847	U
158	0605034A	Tactical Security System (TSS)	05	4,326	6,928			6,928	U
159	0605035A	Common Infrared Countermeasures (CIRCM)	05	32,025	23,179			23,179	U
160	0605036A	Combating Weapons of Mass Destruction (CWMD)	05	10,883	10,000			10,000	U

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145	0604822A	General Fund Enterprise Business System (GFEBS)	05	21,201				21,201	U
146	0604823A	Firefinder	05	20,008				20,008	U
147	0604827A	Soldier Systems - Warrior Dem/Val	05	6,534				6,534	U
148	0604852A	Suite of Survivability Enhancement Systems - EMD	05	82,459				82,459	U
149	0604854A	Artillery Systems - EMD	05	11,611				11,611	U
150	0605013A	Information Technology Development	05	142,678				142,678	U
151	0605018A	Integrated Personnel and Pay System-Army (IPPS-A)	05	115,286				115,286	U
152	0605028A	Armored Multi-Purpose Vehicle (AMPV)	05	96,594				96,594	U
153	0605029A	Integrated Ground Security Surveillance Response Capability (IGSSR-C)	05						U
154	0605030A	Joint Tactical Network Center (JTNC)	05	16,264				16,264	U
155	0605031A	Joint Tactical Network (JTN)	05	31,696				31,696	U
156	0605032A	TRACTOR TIRE	05						U
157	0605033A	Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)	05	5,976				5,976	U
158	0605034A	Tactical Security System (TSS)	05						U
159	0605035A	Common Infrared Countermeasures (CIRCM)	05	23,321		2,300	2,300	25,621	U
160	0605036A	Combating Weapons of Mass Destruction (CWMD)	05						U

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161	0605038A	Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) Sensor Suite	05	14,517	6,054			6,054	U
162	0605041A	Defensive CYBER Tool Development	05	33,796	50,662			50,662	U
163	0605042A	Tactical Network Radio Systems (Low-Tier)	05	18,761	28,404			28,404	U
164	0605047A	Contract Writing System	05	40,341	17,082			17,082	U
165	0605049A	Missile Warning System Modernization (MWSM)	05	7,321	1,539			1,539	U
166	0605051A	Aircraft Survivability Development	05	56,067	55,057		77,420	132,477	U
167	0605052A	Indirect Fire Protection Capability Inc 2 - Block 1	05	92,674	194,366			194,366	U
168	0605053A	Ground Robotics	05	65,311	26,104			26,104	U
169	0605054A	Emerging Technology Initiatives	05	46,451	37,696			37,696	U
170	0605145A	Medical Products and Support Systems Development	05						U
171	0605203A	Army System Development & Demonstration	05		164,883		19,527	184,410	U
172	0605205A	Small Unmanned Aerial Vehicle (SUAV) (6.5)	05						U
173	0605380A	AMF Joint Tactical Radio System (JTRS)	05	15,379					U
174	0605450A	Joint Air-to-Ground Missile (JAGM)	05	12,440	6,585			6,585	U
175	0605457A	Army Integrated Air and Missile Defense (AIAMD)	05	318,850	208,638			208,638	U

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161	0605038A	Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) Sensor Suite	05	4,846				4,846	U
162	0605041A	Defensive CYBER Tool Development	05	28,544				28,544	U
163	0605042A	Tactical Network Radio Systems (Low-Tier)	05	28,178				28,178	U
164	0605047A	Contract Writing System	05	22,860				22,860	U
165	0605049A	Missile Warning System Modernization (MWSM)	05						U
166	0605051A	Aircraft Survivability Development	05	35,893		64,625	64,625	100,518	U
167	0605052A	Indirect Fire Protection Capability Inc 2 - Block 1	05	235,770				235,770	U
168	0605053A	Ground Robotics	05	13,710				13,710	U
169	0605054A	Emerging Technology Initiatives	05	294,739				294,739	U
170	0605145A	Medical Products and Support Systems Development	05	954				954	U
171	0605203A	Army System Development & Demonstration	05	150,201				150,201	U
172	0605205A	Small Unmanned Aerial Vehicle (SUAV) (6.5)	05	5,999				5,999	U
173	0605380A	AMF Joint Tactical Radio System (JTRS)	05						U
174	0605450A	Joint Air-to-Ground Missile (JAGM)	05	8,891				8,891	U
175	0605457A	Army Integrated Air and Missile Defense (AIAMD)	05	193,929				193,929	U

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176	0605625A	Manned Ground Vehicle	05		205,620			205,620	U
177	0605766A	National Capabilities Integration (MIP)	05	12,340	7,835			7,835	U
178	0605812A	Joint Light Tactical Vehicle (JLTV) Engineering and Manufacturing Development Ph	05		7,232			7,232	U
179	0605830A	Aviation Ground Support Equipment	05	7,616	1,664			1,664	U
180	0303032A	TROJAN - RH12	05	5,721	3,936			3,936	U
181	0303267A	Auctioned Spectrum Relocation Fund	05	18,381					U
182	0303367A	Spectrum Access Research and Development	05	285					U
183	0304270A	Electronic Warfare Development	05	8,922	15,232		3,200	18,432	U
184	1205117A	Tractor Bears	05	23,170					U
		System Development & Demonstration		3,119,552	2,989,779		100,147	3,089,926	
185	0604256A	Threat Simulator Development	06	46,732	42,117			42,117	U
186	0604258A	Target Systems Development	06	31,286	28,327			28,327	U
187	0604759A	Major T&E Investment	06	79,214	146,565			146,565	U
188	0605103A	Rand Arroyo Center	06	19,071	13,113			13,113	U
189	0605301A	Army Kwajalein Atoll	06	237,414	238,691			238,691	U
190	0605326A	Concepts Experimentation Program	06	30,667	36,922			36,922	U
191	0605502A	Small Business Innovative Research	06	303,386					U
192	0605601A	Army Test Ranges and Facilities	06	311,027	336,468			336,468	U

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176	0605625A	Manned Ground Vehicle	05	327,732				327,732	U
177	0605766A	National Capabilities Integration (MIP)	05	7,670				7,670	U
178	0605812A	Joint Light Tactical Vehicle (JLTV) Engineering and Manufacturing Development Ph	05	1,742				1,742	U
179	0605830A	Aviation Ground Support Equipment	05	1,467				1,467	U
180	0303032A	TROJAN - RH12	05	3,451				3,451	U
181	0303267A	Auctioned Spectrum Relocation Fund	05						U
182	0303367A	Spectrum Access Research and Development	05						U
183	0304270A	Electronic Warfare Development	05	55,855		3,900	3,900	59,755	U
184	1205117A	Tractor Bears	05						U
		System Development & Demonstration		3,199,798		97,825	97,825	3,297,623	
185	0604256A	Threat Simulator Development	06	14,515				14,515	U
186	0604258A	Target Systems Development	06	10,668				10,668	U
187	0604759A	Major T&E Investment	06	106,270				106,270	U
188	0605103A	Rand Arroyo Center	06	13,481				13,481	U
189	0605301A	Army Kwajalein Atoll	06	231,824				231,824	U
190	0605326A	Concepts Experimentation Program	06	54,898				54,898	U
191	0605502A	Small Business Innovative Research	06						U
192	0605601A	Army Test Ranges and Facilities	06	350,359				350,359	U

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193	0605602A	Army Technical Test Instrumentation and Targets	06	82,617	61,974			61,974	U
194	0605604A	Survivability/Lethality Analysis	06	39,886	35,075			35,075	U
195	0605606A	Aircraft Certification	06	3,796	3,461			3,461	U
196	0605702A	Meteorological Support to RDT&E Activities	06	9,495	6,233			6,233	U
197	0605706A	Materiel Systems Analysis	06	21,043	21,342			21,342	U
198	0605709A	Exploitation of Foreign Items	06	15,026	11,168			11,168	U
199	0605712A	Support of Operational Testing	06	52,139	52,723			52,723	U
200	0605716A	Army Evaluation Center	06	56,532	60,815			60,815	U
201	0605718A	Army Modeling & Sim X-Cmd Collaboration & Integ	06	2,708	2,527			2,527	U
202	0605801A	Programwide Activities	06	60,218	58,175			58,175	U
203	0605803A	Technical Information Activities	06	28,237	30,060			30,060	U
204	0605805A	Munitions Standardization, Effectiveness and Safety	06	66,678	54,458			54,458	U
205	0605857A	Environmental Quality Technology Mgmt Support	06	3,138	4,681			4,681	U
206	0605898A	Army Direct Report Headquarters - R&D - MHA	06	53,526	53,820			53,820	U
207	0606001A	Military Ground-Based CREW Technology	06	4,241	2,141			2,141	U
208	0606002A	Ronald Reagan Ballistic Missile Defense Test Site	06	60,808	62,069			62,069	U

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193	0605602A	Army Technical Test Instrumentation and Targets	06	48,475				48,475	U
194	0605604A	Survivability/Lethality Analysis	06	36,001				36,001	U
195	0605606A	Aircraft Certification	06	2,736				2,736	U
196	0605702A	Meteorological Support to RDT&E Activities	06	6,488				6,488	U
197	0605706A	Materiel Systems Analysis	06	21,859				21,859	U
198	0605709A	Exploitation of Foreign Items	06	7,936		1,000	1,000	8,936	U
199	0605712A	Support of Operational Testing	06	54,470				54,470	U
200	0605716A	Army Evaluation Center	06	63,141				63,141	U
201	0605718A	Army Modeling & Sim X-Cmd Collaboration & Integ	06	2,572				2,572	U
202	0605801A	Programwide Activities	06	87,472				87,472	U
203	0605803A	Technical Information Activities	06	26,244				26,244	U
204	0605805A	Munitions Standardization, Effectiveness and Safety	06	40,133				40,133	U
205	0605857A	Environmental Quality Technology Mgmt Support	06	1,780				1,780	U
206	0605898A	Army Direct Report Headquarters - R&D - MHA	06	55,045				55,045	U
207	0606001A	Military Ground-Based CREW Technology	06						U
208	0606002A	Ronald Reagan Ballistic Missile Defense Test Site	06	71,306				71,306	U

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209	0606003A	CounterIntel and Human Intel Modernization	06	2,636	1,050		1,875	2,925	U
210	0606105A	Medical Program-Wide Activities	06						U
211	0606942A	Assessments and Evaluations Cyber Vulnerabilities	06	88,300	4,500			4,500	U
212	0909980A	Judgment Fund Reimbursement	06	122					U
213	0909999A	Financing for Cancelled Account Adjustments	06	236					U
		Management Support		1,710,179	1,368,475		1,875	1,370,350	
214	0603778A	MLRS Product Improvement Program	07	6,574	14,615			14,615	U
215	0603813A	TRACTOR PULL	07	4,067					U
216	0605024A	Anti-Tamper Technology Support	07	7,159	8,491			8,491	U
217	0607131A	Weapons and Munitions Product Improvement Programs	07	17,992	15,645			15,645	U
218	0607133A	TRACTOR SMOKE	07	12,357					U
219	0607134A	Long Range Precision Fires (LRPF)	07	152,573	156,682			156,682	U
220	0607135A	Apache Product Improvement Program	07	22,914					U
221	0607136A	Blackhawk Product Improvement Program	07	33,906	23,039			23,039	U
222	0607137A	Chinook Product Improvement Program	07	139,003	171,471			171,471	U
223	0607138A	Fixed Wing Product Improvement Program	07	2,146					U
224	0607139A	Improved Turbine Engine Program	07	173,766	206,434			206,434	U

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209	0606003A	CounterIntel and Human Intel Modernization	06	1,063		4,137	4,137	5,200	U
210	0606105A	Medical Program-Wide Activities	06	19,891				19,891	U
211	0606942A	Assessments and Evaluations Cyber Vulnerabilities	06	4,496				4,496	U
212	0909980A	Judgment Fund Reimbursement	06						U
213	0909999A	Financing for Cancelled Account Adjustments	06						U
		Management Support		1,333,123		5,137	5,137	1,338,260	
214	0603778A	MLRS Product Improvement Program	07	10,157				10,157	U
215	0603813A	TRACTOR PULL	07						U
216	0605024A	Anti-Tamper Technology Support	07	8,682				8,682	U
217	0607131A	Weapons and Munitions Product Improvement Programs	07	20,409				20,409	U
218	0607133A	TRACTOR SMOKE	07						U
219	0607134A	Long Range Precision Fires (LRPF)	07	122,733				122,733	U
220	0607135A	Apache Product Improvement Program	07						U
221	0607136A	Blackhawk Product Improvement Program	07	11,236				11,236	U
222	0607137A	Chinook Product Improvement Program	07	46,091				46,091	U
223	0607138A	Fixed Wing Product Improvement Program	07						U
224	0607139A	Improved Turbine Engine Program	07	249,257				249,257	U

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225	0607142A	Aviation Rocket System Product Improvement and Development	07	35,211	1,927			1,927	U
226	0607143A	Unmanned Aircraft System Universal Products	07	36,488	18,132			18,132	U
227	0607145A	Apache Future Development	07		5,448			5,448	U
228	0607150A	Intel Cyber Development	07						U
229	0607312A	Army Operational Systems Development	07		45,026			45,026	U
230	0607665A	Family of Biometrics	07	2,320	1,702			1,702	U
231	0607865A	Patriot Product Improvement	07	72,895	87,430			87,430	U
232	0203728A	Joint Automated Deep Operation Coordination System (JADOCS)	07	29,782	47,398			47,398	U
233	0203735A	Combat Vehicle Improvement Programs	07	321,513	277,633			277,633	U
234	0203743A	155mm Self-Propelled Howitzer Improvements	07	35,681	199,274			199,274	U
235	0203744A	Aircraft Modifications/Product Improvement Programs	07	13,629	9,278			9,278	U
236	0203752A	Aircraft Engine Component Improvement Program	07	146	144			144	U
237	0203758A	Digitization	07	6,077	5,270			5,270	U
238	0203801A	Missile/Air Defense Product Improvement Program	07	3,588	1,287			1,287	U
239	0203802A	Other Missile Product Improvement Programs	07	4,760					U
240	0203808A	TRACTOR CARD	07	34,050					U

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225	0607142A	Aviation Rocket System Product Improvement and Development	07	17,155				17,155	U
226	0607143A	Unmanned Aircraft System Universal Products	07	7,743				7,743	U
227	0607145A	Apache Future Development	07	77,177				77,177	U
228	0607150A	Intel Cyber Development	07	14,652				14,652	U
229	0607312A	Army Operational Systems Development	07	35,851				35,851	U
230	0607665A	Family of Biometrics	07	1,324				1,324	U
231	0607865A	Patriot Product Improvement	07	187,840				187,840	U
232	0203728A	Joint Automated Deep Operation Coordination System (JADOCS)	07	44,691				44,691	U
233	0203735A	Combat Vehicle Improvement Programs	07	268,919				268,919	U
234	0203743A	155mm Self-Propelled Howitzer Improvements	07	427,254				427,254	U
235	0203744A	Aircraft Modifications/Product Improvement Programs	07	11,688				11,688	U
236	0203752A	Aircraft Engine Component Improvement Program	07	80				80	U
237	0203758A	Digitization	07	4,516				4,516	U
238	0203801A	Missile/Air Defense Product Improvement Program	07	1,288				1,288	U
239	0203802A	Other Missile Product Improvement Programs	07	79,424		2,300	2,300	81,724	U
240	0203808A	TRACTOR CARD	07						U

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241	0205402A	Integrated Base Defense - Operational System Dev	07	8,000					U
242	0205410A	Materials Handling Equipment	07	1,132					U
243	0205412A	Environmental Quality Technology - Operational System Dev	07	249	10,000			10,000	U
244	0205456A	Lower Tier Air and Missile Defense (AMD) System	07	74,295	97,746			97,746	U
245	0205778A	Guided Multiple-Launch Rocket System (GMLRS)	07	113,471	117,294			117,294	U
246	0208053A	Joint Tactical Ground System	07						U
248	0303028A	Security and Intelligence Activities	07	40,002	13,845		12,904	26,749	U
249	0303140A	Information Systems Security Program	07	40,148	25,710			25,710	U
250	0303141A	Global Combat Support System	07	51,415	60,076			60,076	U
251	0303142A	SATCOM Ground Environment (SPACE)	07						U
252	0303150A	WWMCCS/Global Command and Control System	07	1,966	2,073			2,073	U
255	0305172A	Combined Advanced Applications	07	1,500					U
256	0305179A	Integrated Broadcast Service (IBS)	07	450	459			459	U
257	0305204A	Tactical Unmanned Aerial Vehicles	07	6,000	5,097		17,050	22,147	U
258	0305206A	Airborne Reconnaissance Systems	07	26,416	11,177		2,000	13,177	U
259	0305208A	Distributed Common Ground/Surface Systems	07	27,109	28,821			28,821	U
260	0305219A	MQ-1C Gray Eagle UAS	07		5,000			5,000	U

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Sec
241	0205402A	Integrated Base Defense - Operational System Dev	07						U
242	0205410A	Materials Handling Equipment	07						U
243	0205412A	Environmental Quality Technology - Operational System Dev	07	259				259	U
244	0205456A	Lower Tier Air and Missile Defense (AMD) System	07	166				166	U
245	0205778A	Guided Multiple-Launch Rocket System (GMLRS)	07	75,575				75,575	U
246	0208053A	Joint Tactical Ground System	07	9,510				9,510	U
248	0303028A	Security and Intelligence Activities	07			23,367	23,367	23,367	U
249	0303140A	Information Systems Security Program	07	29,270				29,270	U
250	0303141A	Global Combat Support System	07	86,908				86,908	U
251	0303142A	SATCOM Ground Environment (SPACE)	07	18,684				18,684	U
252	0303150A	WWMCCS/Global Command and Control System	07						U
255	0305172A	Combined Advanced Applications	07						U
256	0305179A	Integrated Broadcast Service (IBS)	07	467				467	U
257	0305204A	Tactical Unmanned Aerial Vehicles	07	4,051		34,100	34,100	38,151	U
258	0305206A	Airborne Reconnaissance Systems	07	13,283		15,575	15,575	28,858	U
259	0305208A	Distributed Common Ground/Surface Systems	07	47,204				47,204	U
260	0305219A	MQ-1C Gray Eagle UAS	07						U

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)	Sec
261	0305232A	RQ-11 UAV	07	6,180	3,218			3,218	U
262	0305233A	RQ-7 UAV	07	17,863	7,817			7,817	U
263	0307665A	Biometrics Enabled Intelligence	07	6,524	2,000		2,214	4,214	U
264	0708045A	End Item Industrial Preparedness Activities	07	106,766	108,348			108,348	U
265	1203142A	SATCOM Ground Environment (SPACE)	07	9,927	34,169			34,169	U
266	1208053A	Joint Tactical Ground System	07	7,400	7,677			7,677	U
9999	9999999999	Classified Programs		5,955	7,273			7,273	U
		Operational Systems Development		1,721,365	1,844,126		34,168	1,878,294	
267	0608041A	Defensive CYBER - Software Prototype Development	08						U
		Software and Digital Technology Pilot Program							
Total Research, Development, Test & Eval, Army				11,371,268	12,543,435		147,304	12,690,739	

Department of the Army
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

17 Jan 2020

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

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Sec
261	0305232A	RQ-11 UAV	07						U
262	0305233A	RQ-7 UAV	07						U
263	0307665A	Biometrics Enabled Intelligence	07						U
264	0708045A	End Item Industrial Preparedness Activities	07	61,012				61,012	U
265	1203142A	SATCOM Ground Environment (SPACE)	07						U
266	1208053A	Joint Tactical Ground System	07						U
9999	9999999999	Classified Programs		3,983				3,983	U
		Operational Systems Development		1,998,539		75,342	75,342	2,073,881	
267	0608041A	Defensive CYBER - Software Prototype Development	08	46,445				46,445	U
		Software and Digital Technology Pilot Program		46,445				46,445	
Total Research, Development, Test & Eval, Army				12,587,343		182,824	182,824	12,770,167	

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

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

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

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

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603305A *I Army Missle Defense Systems Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	60.301	59.487	11.062	-	11.062	11.651	11.687	12.313	12.552	0.000	179.053
FG6: *Missile Defense (CA)*	-	49.700	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.700
TR5: *Missile Defense Battlelab*	-	10.601	59.487	11.062	-	11.062	11.651	11.687	12.313	12.552	0.000	129.353

A. Mission Description and Budget Item Justification

This Program Element (PE) funds missile defense systems integration efforts for both the US Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) and USSPACECOM.

USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for ground-based midcourse defense (GMD), the Army integrator for global missile defense, and the Army Service Component Command (ASCC) of the U.S. Strategic Command (USSTRATCOM). Army Regulation (AR) 10-87 Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007 and AR 5-22 The Army Force Modernization Proponent System dated 19 August 2009 designates USASMDC/ARSTRAT as the Army specified proponent for Global Missile Defense capabilities. As the Army proponent for GMD, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conducting warfighting experiments to validate those concepts, identifying capabilities needed to implement the validated concepts, and developing Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions to realize the GMD capabilities. As the Army integrator for global missile defense, USASMDC/ARSTRAT is responsible for reviewing programs managed by the Army, other Services, Defense agencies and National agencies to ensure that they are correctly synchronized and will ultimately provide the capabilities required by USSTRATCOM to execute its global missile defense responsibilities.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	60.472	10.987	10.947	-	10.947
Current President's Budget	60.301	59.487	11.062	-	11.062
Total Adjustments	-0.171	48.500	0.115	-	0.115
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	48.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.171	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	0.115	-	0.115

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603305A *I Army Missle Defense Systems Integration*

Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2019**	**FY 2020**
Project: FG6: *Missile Defense (CA)*		
Congressional Add: *Missile Defense (CA)*	49.700	-
Congressional Add Subtotals for Project: FG6	49.700	-
Project: TR5: *Missile Defense Battlelab*		
Congressional Add: *Conventional Mission Capabilities*	-	3.000
Congressional Add: *Hypersonic Advanced Technology Testbed*	-	15.000
Congressional Add: *Integrated Environmental Control and Power*	-	8.000
Congressional Add: *Pragmatic Artificial Intelligence and new Technology Laboratory*	-	7.500
Congressional Add: *Hypersonic Testing and Related Technology Development*	-	15.000
Congressional Add Subtotals for Project: TR5	-	48.500
Congressional Add Totals for all Projects	49.700	48.500

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) FG6 / *Missile Defense (CA)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FG6: *Missile Defense (CA)*	-	49.700	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.700
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project focuses on four major efforts: 1) High Power Microwave Lethality Prototype testing, testing and modeling will be performed to ascertain the vulnerabilities of critical electrical circuits and components in order to attack adversary systems, such as unmanned aerial systems, and to protect U.S. assets and infrastructure in use by the Warfighter; 2) Advanced Electronic/Environmental Control Unit Thermal Management Prototypes of different sizes will be built and tested to reduce the magnitude of fuel used at forward operating bases consumed by environmental control units to keep major electronic systems cool in austere environments. Prototypes will be used to fully evaluate distributed cooling and legacy approaches; 3) Technology Complex Compound Materials for Thermal/Energy Management prototypes will be manufactured and tested for suitability in high velocity impacts. The planned compound is Coordinative Molecular Bond Armor Material and has potential to provide ballistics and thermal protection; 4) Upgrades are planned for the Advanced Measurement Optical Range facility to support laser radar development and testing; 5) HardWare-In-the-Loop (HWIL) for both open-loop device characterization and closed-loop dynamic hardware-in-the-loop simulation to characterize guidance and track-loop performance. Simulate trajectories, and engagement would be utilized to drive the HWIL simulations (e.g. 3DOF, 6DOF); 6) Integration of a Fire Control (FC) for the near-term Long-Range Weapon System requirements for initial operational capability. Long range hypersonic weapon analysis, integration and fielding support.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Missile Defense (CA)	49.700	-
FY 2019 Accomplishments: Missile Defense (CA)		
Congressional Adds Subtotals	49.700	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) FG6 / *Missile Defense (CA)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support	SS/CPFF	Huntsville : Huntsville	3.303	-		-		-		-		-	0.000	3.303	-
		Subtotal	3.303	-		-		-		-		-	0.000	3.303	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
High Power Microwave Lethality	SS/CPFF	Radiance : Huntsville	3.900	10.000		-		-		-		-	0.000	13.900	-
Advanced Electronic/ Environmental Control Unit Thermal Management Prototype	SS/CPAF	Rocky Research : Huntsville	28.000	15.000		-		-		-		-	0.000	43.000	-
Technology Complex Compound Materials for Thermal/Energy Management Prototype	SS/CPFF	Radiance : huntsville	2.250	-		-		-		-		-	0.000	2.250	-
Advanced Measurement Optical Range Facility Upgrades	SS/CPFF	Radiance : Huntsville	6.194	-		-		-		-		-	0.000	6.194	-
HWIL Scene Generation and Software Development Lab	SS/CPFF	People Tech : Huntsville	-	8.700		-		-		-		-	0.000	8.700	-
HWIL Environmental Simulators	SS/CPFF	Hill Technologies : Huntsville	-	11.000		-		-		-		-	0.000	11.000	-
Long Ranage Weapons Analysis	SS/CPFF	Radiance : Huntsville	-	5.000		-		-		-		-	0.000	5.000	-
		Subtotal	40.344	49.700		-		-		-		-	0.000	90.044	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) FG6 / *Missile Defense (CA)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
High Power Microwave Lethality Prototype	SS/CPFF	Georgia Tech : Georgia	0.203	-		-		-		-		-	0.000	0.203	-
Advanced Meaasurement Optical Range Facility Upgrade	SS/CPFF	Huntsville : Huntsville	0.150	-		-		-		-		-	0.000	0.150	-
		Subtotal	0.353	-		-		-		-		-	0.000	0.353	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	44.000	49.700		0.000		-		-		-	0.000	93.700	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** FG6 / *Missile Defense (CA)*

	FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advanced Measurement Optical Range Facility Upgrades																												

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advanced Measurement Optical Range Facility Upgrades																												

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** FG6 / *Missile Defense (CA)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Advanced Measurement Optical Range Facility Upgrades	2	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
TR5: *Missile Defense Battlelab*	-	10.601	59.487	11.062	-	11.062	11.651	11.687	12.313	12.552	0.000	129.353
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project TR5 funds United States Army Space and Missile Defense Command/ Army Strategic Command (USASMDC/ARSTRAT) efforts to develop the associated operational prototyping, experimentation, operational analysis, and modeling and simulation in support of missile defense capabilities for current and future Forces.

USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for ground-based midcourse defense (GMD), the Army integrator for global missile defense, and the Army Service Component Command (ASCC) of the U.S. Strategic Command (USSTRATCOM). Army Regulation (AR) 10-87 Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007 and AR 5-22 The Army Force Modernization Proponent System dated 19 August 2009 designates USASMDC/ARSTRAT as the Army specified proponent for Global Missile Defense. As the Army proponent GMD, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conducting warfighting experiments to validate those concepts, identifying capabilities needed to implement the validated concepts, and developing Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions to realize the GMD capabilities. As the Army integrator for global missile defense, USASMDC/ ARSTRAT is responsible for reviewing programs managed by the Army, other Services, Defense agencies and National agencies to ensure that they are correctly synchronized and will ultimately provide the capabilities required by USSTRATCOM to execute its global missile defense responsibilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Prototypes	6.359	6.556	6.694
Description: Funding is provided for the following efforts: continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command will participate and support biennial rewrites of Army Capstone, Operational and Functional Concepts. Continue to provide operational manager support to STRATCOM, NORTHCOM and SOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional COCOMs; Developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional COCOM. A focus area will be informing the Missile Defeat Integrated Capability Development Working Group with experimentation on improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Another project is developing and implementing a training environment for cyber defenders to train on defense of the GMD fire control networks through innovative scenario based training environments. Continue			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
to support TRADOC proponents with their responsibilities relative to doctrine, organization, training, material, leader development and education, personnel, and facilities (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversite for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC/ARSTRAT is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army-specific applications of the Command and Control, Battle Management and Communications program. Provide Government program management and oversite for National Capital Region?s Integrated Air Defense System. ***FY 2020 Plans:*** Take the lessons learned from the FY 2019 efforts to continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command will participate and support biennial rewrites of Army Capstone, Operational and Functional Concepts. Continue to provide operational manager support to STRATCOM, NORTHCOM and SOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional COCOMs; Developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional COCOM. A focus area will be informing the Missile Defeat Integrated Capability Development Working Group with experimentation on improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Another project is developing and implementing a training environment for cyber defenders to train on defense of the GMD fire control networks through innovative scenario based training environments. Continue to support TRADOC proponents with their responsibilities relative to doctrine, organization, training, material, leader development and education, personnel, and facilities (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversite for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC/ARSTRAT is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army-specific applications of the Command and Control, Battle Management and Communications program. Provide Government program management and oversite for National Capital Region?s Integrated Air Defense System. These funds will be executed by USASMDC / ARSTRAT, Future Warfare Center. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Take the lessons learned from the FY 2020 efforts to continue to evaluate new technologies in realistic operating environments. This is accomplished by participating in and providing support to Unified Quest wargames and experiments to analyze and integrate technology to identify the feasibility integration into Army missile defense systems. The Space and Missile Defense Command will participate and support biennial rewrites of Army Capstone, Operational and Functional Concepts. Continue to provide operational manager support to USSTRATCOM, USNORTHCOM and USSOCOM Joint Technical Capability Demonstrations to ensure Army missile defense equities are represented in advanced technology developments by demonstrating military utility when applied to military equipment and techniques. Examples include: supporting multi service experiments and capability development of the national-directed Phased Adaptive Approach (PAA) for Ballistic Missile Defense (BMD) as it is applied to each of the regional CCMDs; developing effective Integrated Missile Defense concepts for Army support to the Phased Adaptive Approach (PAA) being implemented within each regional CCMD. A focus area will be improving upon the Missile Defeat Integrated Capability Development Working Group formed in FY 2020 with additional experimentation aimed at on further improving the timeliness and effectiveness of counter ballistic missile time sensitive targeting. Continue support to TRADOC proponents with their responsibilities relative to doctrine, organization, training, material, leader development and education, personnel, facilities and policy (DOTMLPF-P) plus related matters to continue missile defense proponent input to Joint Capabilities Integration and Development System (JCIDS), Science and Technology, Concept Development, and Capability Development. Provide Government program management and oversight for DOTMLPF-P development and analysis for missile defense-related programs for which USASMDC/ARSTRAT is the Army's proponent - Ground-based Midcourse Defense System, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) Forward-based Mode Radar (FBM), and Army- specific applications of the Command and Control, Battle Management and Communications program. Specifically, provide support to Ground-based Midcourse Defense (GMD) Missile Field #4 (MF4) development and construction. Provide support to recapitalized MEP-810C generator fielding and radar site power conversion activities in USINDOPACOM AOR. Provide Hardened Transportable Terminal fielding to USCENTCOM, USINDOPACOM, and USEUCOM AORs and continue to support C2BMC software development, integration, fielding, and operations & sustainment activities. Provide Government program management and oversite for National Capital Region's Integrated Air Defense System. These funds will be executed by USASMDC / ARSTRAT, Future Warfare Center in FY 2021. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Adjustment to economic assumptions.			
Title: Analysis, and Models and Simulations (M&S)	4.242	4.245	4.368
Description: Funding is provided for the following efforts: evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and cost reduction analysis of missile defense systems. Realistic operating environments will be available to determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The FWC will continue to provide program management for maintenance, sustainment, and development for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures. ***FY 2020 Plans:*** Take the lessons learned from the FY 2019 efforts and evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and cost reduction analysis of missile defense systems. Realistic operating environments will be available to determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense capabilities. The Future Warfare Center (FWC) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The FWC will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The FWC will continue to provide program management for maintenance, sustainment, and development for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures. These funds will be executed by USASMDC / ARSTRAT, Future Warfare Center. ***FY 2021 Plans:*** Take the lessons learned from the FY 2020 efforts and evaluate new technologies in realistic operating environments. This will be accomplished by supporting ongoing efforts that provide the most realistic operating environment available to perform technology gap and cost reduction analysis of missile defense systems. Realistic operating environments will be available to determine the ability of the specific technologies to fill capability gaps in terms of utility to the warfighter. Support of technology demonstrations, Analysis and Demonstration Tools/Test Beds for evolving missile defense concepts will address emerging needs and continue to be expanded to ensure that advanced technology development can adequately enhance missile defense			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) will continue to provide program management for maintenance, sustainment, and development for Extended Air Defense Simulation (EADSIM) delivering the required high fidelity synthetic operating environment to provide the capability to perform system and cost benefit analysis, operational planning, and exercise/ experimentation support. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for Reconfigurable Tactical Operations Simulator (RTOS) and Future Force Experimentation Air Defense Simulation (FFEADS) delivering operator in the loop capability for air and missile defense simulation in distributed exercises and experiments. The SMD CoE will continue to provide program management for maintenance, sustainment, and development for the Joint Embedded Messaging System (JEMS) providing data translation application that enables communications between disparate systems, protocols and architectures. These funds will be executed by USASMDC SMD CoE. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Adjustment to economic assumptions.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.186	-
Accomplishments/Planned Programs Subtotals	10.601	10.987	11.062

	FY 2019	FY 2020
Congressional Add: Conventional Mission Capabilities ***FY 2020 Plans:*** Conventional Mission Capabilities	-	3.000
Congressional Add: Hypersonic Advanced Technology Testbed ***FY 2020 Plans:*** Hypersonic Advanced Technology Testbed	-	15.000
Congressional Add: Integrated Environmental Control and Power ***FY 2020 Plans:*** Integrated Environmental Control and Power	-	8.000
Congressional Add: Pragmatic Artificial Intelligence and new Technology Laboratory	-	7.500

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

	FY 2019	FY 2020
FY 2020 Plans: Pragmatic Artificial Intelligence and new Technology Laboratory		
Congressional Add: Hypersonic Testing and Related Technology Development	-	15.000
FY 2020 Plans: Hypersonic Testing and Related Technology Development		
Congressional Adds Subtotals	-	48.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Personnel and Operations Support	C/TBD	To Be determined : To be Determined	-	9.364		7.196		7.307		-		7.307	0.000	23.867	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.186		-		-		-	0.000	0.186	-
		Subtotal	-	9.364		7.382		7.307		-		7.307	0.000	24.053	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contracts	Various	To Be Determined : To Be determined	1.156	1.237		3.667		3.755		-		3.755	0.000	9.815	-
Various	Various	To be determined : to be determined	-	-		48.438		-		-		-	0.000	48.438	-
		Subtotal	1.156	1.237		52.105		3.755		-		3.755	0.000	58.253	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Experiments & technology enhancements of prototypes/tools and analysis.	Various	Various Colorado Springs CO and Huntsville AL : Alabama, Colorado Springs	117.427	-		-		-		-		-	Continuing	Continuing	Continuing
Govt Support and Support Contracts	Various	Various Colorado Springs CO and Huntsville AL : Alabama, Colorado Springs	138.783	-		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	256.210	-		-		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / *Army Missle Defense Systems Integration*	Project (Number/Name) TR5 / *Missile Defense Battlelab*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	257.366	10.601		59.487		11.062		-		11.062	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

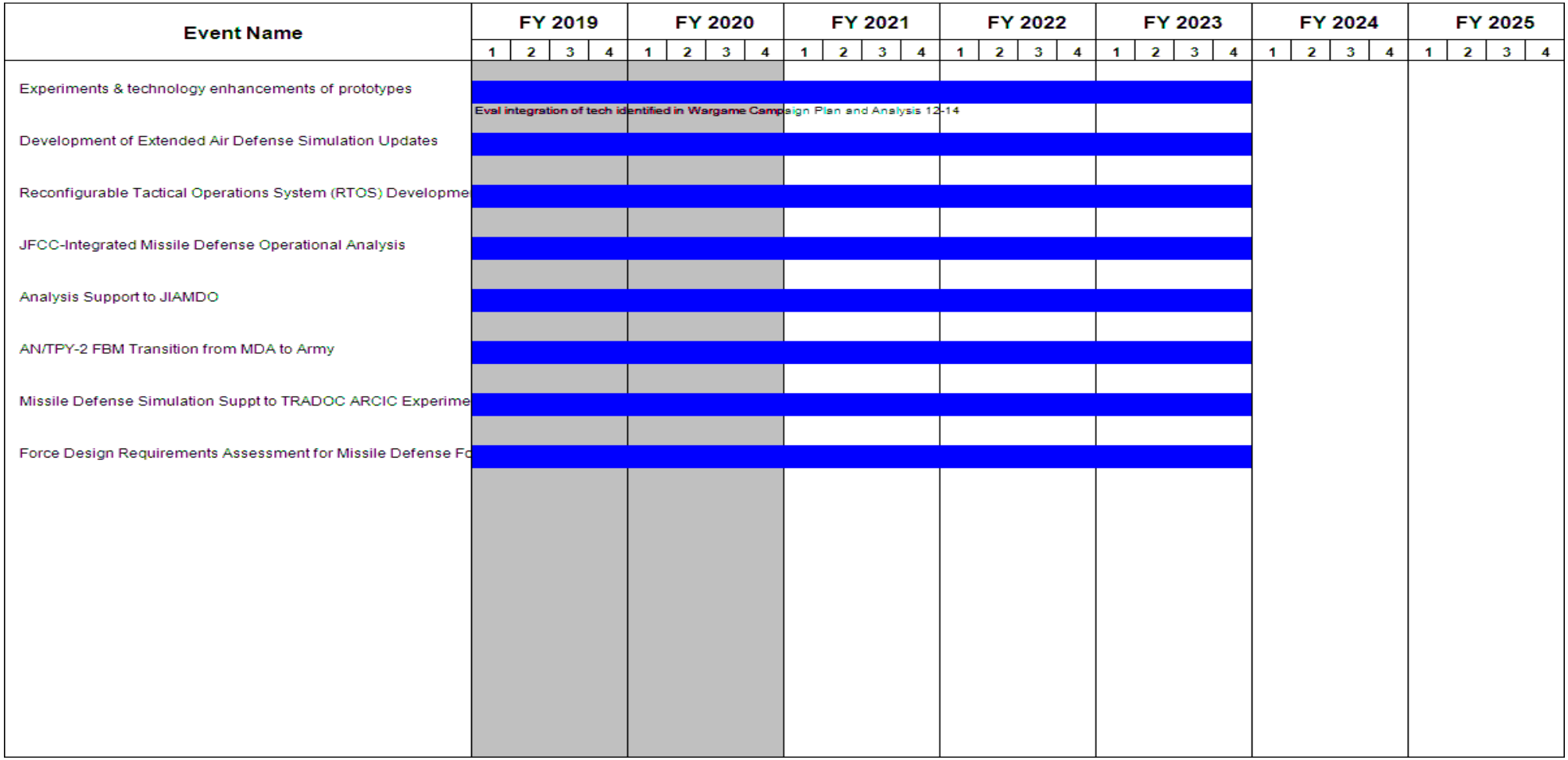

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603305A / *Army Missle Defense Systems Integration*	**Project (Number/Name)** TR5 / *Missile Defense Battlelab*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Experiments & technology enhancements of prototypes	1	2018	4	2023
Development of Extended Air Defense Simulation Updates	1	2018	4	2023
Reconfigurable Tactical Operations System (RTOS) Development	1	2018	4	2023
JFCC-Integrated Missile Defense Operational Analysis	1	2018	4	2023
High Energy Laser for AMD	1	2015	4	2018
Analysis Support to JIAMDO	1	2018	4	2023
AN/TPY-2 FBM Transition from MDA to Army	1	2018	4	2023
Missile Defense Simulation Suppt to TRADOC ARCIC Experimentation	1	2018	4	2023
Force Design Requirements Assessment for Missile Defense Forces	1	2018	4	2023
Allied and Partner Modeling to Inform Integration Efforts to Meet Objectives	3	2016	4	2018
Pacific Focused-Adversary Centric Bundled	3	2016	4	2018
Inert Debris Analysis	3	2017	2	2018
Hypersonics Analysis	2	2017	4	2018

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603308A *I Army Space Systems Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	26.230	-	26.230	18.775	17.484	18.517	18.937	0.000	99.943
990: *Space And Missile Defense Integration*	-	0.000	0.000	26.230	-	26.230	18.775	17.484	18.517	18.937	0.000	99.943

A. Mission Description and Budget Item Justification

All Project FE5 funding is being transfer to Project 990 funding in FY2021
USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for space, the Army integrator for global missile defense (GMD), and the Army Service Component Command (ASCC) of the USSTRATCOM. Army Regulation (AR) 10-87, Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007, and AR 5-22, The Army Force Modernization Proponent System, dated 19 August 2009, designated USASMDC/ARSTRAT as the Army specified proponent for Space/High Altitude capabilities. As the Army proponent for space and high altitude, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conduct warfighting experiments to validate those concepts, identify capabilities needed to implement the validated concepts, and develop Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions.

The Friendly Force Data Integration and Management (FFDIM) Capability Definition Package (CDP), a Joint Capabilities Integration and Development System (JCIDS) requirements document (October 2017) validated the Joint Friendly Force Tracking (JFFT) Testbed's development, testing and integration capabilities and Friendly Force Tracking (FFT) System Expert support provided by U.S. Army Space and Missile Defense Command (USASMDC) as U.S. Strategic Command's (USSTRATCOM's) Army Service Component Command (ASCC). In addition, Chairman of the Joint Chiefs of Staff Instruction 3910 (FFT Operations Guidance) directs USSTRATCOM's ASCC to execute eight specified FFT mission support responsibilities that include providing a testing and development capability to support joint, interagency and coalition partners FFT operations. USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for space, the Army integrator for global missile defense (GMD), and the Army Service Component Command (ASCC) of the USSTRATCOM. Army Regulation (AR) 10-87, Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007, and AR 5-22, The Army Force Modernization Proponent System, dated 19 August 2009, designated USASMDC/ARSTRAT as the Army specified proponent for Space/High Altitude capabilities. As the Army proponent for space and high altitude, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conduct warfighting experiments to validate those concepts, identify capabilities needed to implement the validated concepts, and develop Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603308A *I Army Space Systems Integration*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	26.230	-	26.230
Total Adjustments	0.000	0.000	26.230	-	26.230
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	26.230	-	26.230

Change Summary Explanation

All Project FE5 funding transfers to Project 990 funding in FY2021.

USASMDC/ARSTRAT Future Warfare Center will execute $20.957M of these funds in FY2021.

The APNT CFT will execute $5.0M of these funds in FY2021.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603308A / *Army Space Systems Integration*	Project (Number/Name) 990 / *Space And Missile Defense Integration*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
990: *Space And Missile Defense Integration*	-	0.000	0.000	26.230	-	26.230	18.775	17.484	18.517	18.937	0.000	99.943
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This effort transitioned from 1206308A / FE5.

A. Mission Description and Budget Item Justification

USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for space, the Army integrator for global missile defense (GMD), and the Army Service Component Command (ASCC) of the USSTRATCOM. Army Regulation (AR) 10-87, Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007, and AR 5-22, The Army Force Modernization Proponent System, dated 19 August 2009, designated USASMDC/ARSTRAT as the Army specified proponent for Space/High Altitude capabilities. As the Army proponent for space and high altitude, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conduct warfighting experiments to validate those concepts, identify capabilities needed to implement the validated concepts, and develop Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions.

The Friendly Force Data Integration and Management (FFDIM) Capability Definition Package (CDP), a Joint Capabilities Integration and Development System (JCIDS) requirements document (October 2017) validated the Joint Friendly Force Tracking (JFFT) Testbed's development, testing and integration capabilities and Friendly Force Tracking (FFT) System Expert support provided by U.S. Army Space and Missile Defense Command (USASMDC) as U.S. Strategic Command's (USSTRATCOM's) Army Service Component Command (ASCC). In addition, Chairman of the Joint Chiefs of Staff Instruction 3910 (FFT Operations Guidance) directs USSTRATCOM's ASCC to execute eight specified FFT mission support responsibilities that include providing a testing and development capability to support joint, interagency and coalition partners FFT operations. USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for space, the Army integrator for global missile defense (GMD), and the Army Service Component Command (ASCC) of the USSTRATCOM. Army Regulation (AR) 10-87, Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007, and AR 5-22, The Army Force Modernization Proponent System, dated 19 August 2009, designated USASMDC/ARSTRAT as the Army specified proponent for Space/High Altitude capabilities. As the Army proponent for space and high altitude, USASMDC is responsible for developing warfighting concepts, conduct warfighting experiments to validate those concepts, identify capabilities needed to implement the validated concepts, and develop Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Architecture Development, War games and Demonstrations	-	-	11.945
Description: All Project FE5 funding is being transfer to Project 990 funding in FY 2021.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding is provided for planning, developing, and executing architectures and combat development solutions for Army integration of space systems, space control capabilities, missile defense, and high altitude systems. ***FY 2021 Plans:*** USASMDC Space and Missile Defense Center of Excellence (SMDCOE) will continue the full spectrum of JCIDS concept to capability development efforts to enhance the resiliency and effectiveness of critical space-based and space enabled assets and JCIDS capability development activities for space superiority, theater missile warning, high altitude, and emerging concepts/ technology for the full range of Navigation Warfare, tactical space layer, hypersonics, counter hypersonics, and directed energy. SMDCoE will participate in robust campaign of learning with the Army, Army Futures Command, Joint and sister service wargaming, experimentation, live prototyping, studies, assessments, and exercises to learn, validate, develop, and integrate the concepts and technology described above. SMDCOE will provide support to PEO IEWS and PEO M&S to acquire and field space superiority and enhanced missile warning capabilities. A JTAGS Block III CDD will be written to document the requirements to meet advanced missile threats and to counter hypersonics. A high altitude CDD will be written to capture the requirements for a high altitude, multi-mission, persistent platform to provide resiliency for space based capabilities. A Theater Space Warfare Operational and Organizational Concept and Army Space concept will capture the observations and insights from the campaign of learning and drive required capability development consistent with the Army's Operating Concept of Multi-Domain Operations (MDO) and CSA and Army Modernization Enterprise guidance for MDO capable forces by 2028 and MDO ready forces by 2035. CAPDEV, across the DOTMLPF-P, support will be provided to the APNT CFT to document the enduring requirements for the tactical space layer and NAVWAR capabilities for situational awareness, assured PNT and PNT denial to our adversaries. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** PE 1206308 FE5 FY 2020 funding transfers to Project 990 in FY 2021			
Title: Joint Friendly Force Tracking (J-FFT) Testbed ***Description:*** All Project FE5 funding is being transfer to Project 990 funding in FY 2021. Joint-Friendly Force Tracking (J-FFT) division provides capabilities development, sustainment, and technical support to the Friendly Force Tracking (FFT) and Hostile Force Tagging, Tracking, and Locating (HF TTL) efforts of Combatant Commanders, Services, U.S. Government Agencies, Allies, and Coalition partners to support situational awareness (SA), command and control (C2), interoperability, fratricide prevention, and lethality projection. J-FFT develops solutions at all classification levels to integrate FFT, HF TTL and other Position Location Information (PLI) and C2 data into current and planned architectures, systems, and operational pictures, and support development and deployment of requirements to satisfy rapidly evolving Joint C2 requirements. Major customers: SMDC Force Tracking Mission Management Center (FT MMC); Special Operations Command (SOCOM); Africa Command (AFRICOM); Air Force Rapid Capabilities Office (AF RCO); Joint Staff J6. J-FFT enables the FT MMC to support: 59	-	-	3.250

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
device types; 22 data architectures; 518 user groups; over 146K registered devices; over 5M FFT reports/day; over 400 distress messages ("911") alert reports/year. USSTRATCOM, in accordance with CJCSI 3910.01 (reference V.4.) is designated one of three coordinating agencies for J-FFT within DoD. CJCSI 3910.01 directs eight Force Modernization tasks to USSTRATCOM. USSTRATCOM SI 534-5 (reference V.6.) and annually published USSTRATCOM operations orders have designated USASMDC/ ARSTRAT as the lead USSTRATCOM component command for Friendly Force Tracking (FFT). ***FY 2021 Plans:*** J-FFT Testbed supports SMDC Force Tracking Mission Management Center (FT MMC) Special Operations Command (SOCOM) Africa Command (AFRICOM) Air Force Rapid Capabilities Office (AF RCO) Joint Staff J6 and other U.S. Government agencies by providing agile capability development and integrated solutions to validated requirements that enable interoperable force tracking data exchange and satisfy joint, agency and coalition warfighting needs for timely, accurate Common Operational Picture (COP) displays and decision making. JFFT development will continue to respond to the growth in FFT device use by enabling the number of device types, data types, and displays supported by the various FFT and HF TTL data architectures. The JFFT Testbed is scheduled to develop and deliver new capabilities including command and control messaging, new FFT and HF TTL data sources and devices, and the ratified NATO message standard for FFT. Also planned is the inclusion of cloud data services at the Impact Level 2 (IL 2) (publicly releasable data), IL 5 (unclassified national security data), and IL 6 (secret), and re-design and implementation of needed upgrades to the Force Tracking Web product, fulfilling requirements for added functionality in data visualization and management. JFFT will continue to exploit, expand and provide mission owners with approved infrastructures at all classification levels that achieve improved performance and reduce costs. JFFT Testbed will remain a key contributor to support North Atlantic Treaty Organization Capability Team activities and other coalition assessments and exercises that advance US and coalition FFT interoperability. USASMDC Space and Missile Defense Center of Excellence (SMDCOE) will execute these funds in FY 2021. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** PE 1206308 FE5 FY 2020 funding transfers to Project 990 in FY 2021			
Title: Organizational Development as Part of the SRC40 Proponecy Mission ***Description:*** All Project FE5 funding is being transfer to Project 990 funding in FY 2021. Continue participation in the Force Design Update (FDU) process. Development of Operational & Organizational (O&O) Concept Papers, Organization Design Papers, Cost Benefit Analyses, Unit Reference Sheets (URS), and Manpower Requirements Criteria (MARC) determination. ***FY 2021 Plans:***	-	-	2.925

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Continue to participate in the Force Design Update (FDU) process. The U.S. Army Space and Missile Defense Command (USASMDC) Space and Missile Defense Center of Excellence (SMDCoE) will participate in the recurring process used to gain HQDA approval of organizational structure changes and designs through the FDU and FDU Jr. processes. This includes the development of Operational & Organizational Concept Papers, Organization Design Papers, Cost Benefit Analyses, Unit Reference Sheets, and Manpower Requirements Criteria determination. Participate in the Total Army Analysis (TAA), the Army's annual process to examine the projected Army force qualitatively and quantitatively. USASMDC will support TAA Rule of Allocation development, Capability Demand Analysis and Resourcing phases to ensure SRC40 units are properly accounted for in the future Program Objectives Memorandum (POM) Force. This is performed to analyze the projected Army Force against future demands and levels of funding/authorizations to build the POM Force. USASMDC SMDCOE will review the USASMDC Troops, Organization and Equipment (TOE) requirements documents conducted as part of a cyclic process as well when needed during other Force Design processes (i.e.-Basis of Issue Plan (BOIP) Modernization Path (MODPATH) reviews, Notification of Change reviews, SSN-LIN Automated Management and Integrating System (SLAMIS) reviews, etc.). Participate in BOIP Development. BOIP Development is collection of processes including the cyclic review of Army-wide BOIPs under development, development of Feeder Data for USASMDC proponent item BOIPs, and validation of BOIP MODPATHs to USASMDC TOEs. Complete the Space Forces Force Structure Review which is a Cost-Benefit Analysis-like structured three-phased process consisting of a Needs Analysis, Gap Analysis, and Solutions Analysis to identify and document organizational based capability needs and gaps, develop a prioritized list of those gaps, and identify potential materiel and/or non-materiel solutions. U.S. Army Space and Missile Defense Command (USASMDC) Space and Missile Defense Center of Excellence (SMDCoE) will execute these funds in FY 2021. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** PE 1206308 FE5 FY 2020 funding transfers to Project 990 in FY 2021			
Title: Position, Navigation, and Timing Navigation Warfare (PNT/NAVWAR) ***Description:*** USASMDC Space and Missile Defense Center of Excellence (SMDCOE) will continue JCIDS capability development efforts to enhance the resiliency and effectiveness of critical space-based and space enabled assets and JCIDS capability development activities for space superiority, theater missile warning, high altitude, and emerging concepts/ technology for the full range of Navigation Warfare, tactical space layer, hypersonics, counter hypersonics, and directed energy. SMDCOE will provide support to PEO IEWS and PEO M&S to acquire and field space superiority and enhanced missile warning capabilities. A JTAGS Block III CDD will be written to document the requirements to meet advanced missile threats and to counter hypersonics. A high altitude CDD will be written to capture the requirements for a high altitude, multi-mission, persistent platform to provide resiliency for space based capabilities. CAPDEV support will be provided to the APNT CFT to document the enduring	-	-	3.110

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
requirements for the tactical space layer and NAVWAR capabilities for situational awareness, assured PNT and PNT denial to our adversaries. U.S. Army Space and Missile Defense Command (USASMDC) Space and Missile Defense Center of Excellence (SMDCoE) will execute these funds in FY 2021. ***FY 2021 Plans:*** Based on the results of our efforts in 2020 the USASMDC Space and Missile Defense Center of Excellence will continue to identify and advocate for PNT and NAVWAR emerging requirements through Commander, U.S. Strategic Command to the joint staff to establish and formalize joint NAVWAR requirements, in the JCIDS process. Support the Army Assured Positioning Navigation and Timing (APNT) Cross Functional Team by conducting required capability analysis and developing JCIDS documents for APNT Enabling systems and APNT Situational Awareness. Specific actions planned are ? Write Alternate Navigation Concept of Operations ? Support planning and execution of Lonestar Development Operations ? Support planning and execution of Alternate Navigation Development Operations ? Write and coordinate Gunsmoke requirements document ? Write and coordinate Lonestar requirements document ? Document Alternate Navigation requirements ? Obtain input from the NAVWAR Community of Interest and write NAVWAR Attack CONOPS ? Support execution of NAVWAR Attack Study ? Facilitate inclusion of NAVWAR Attack systems in Army experiment, exercises, war games and other events to build knowledge about the Army need for this capability ? Write and coordinate NAVWAR Attack requirements document ? Identify how NAVWAR Attack concepts and capabilities will Multi-Domain operations ? Provide NAVWAR and space subject matter expertise to help develop Fires Organizational and Operational Concept Document ? Furnish NAVWAR subject matter expertise to support revision of Space Brigade Organizational and Operational Concept Division ? Conduct analysis to determine if the fielding of a candidate NAVWAR technology would drive organizational changes ***FY 2020 to FY 2021 Increase/Decrease Statement:*** PE 1206308 FE5 FY 2020 funding transfers to Project 990 in FY 2021			
Title: APNT Integrated Space Communications	-	-	5.000
Description: Development of a unique advanced space communications capability to explore advanced ground based space communications technologies and concepts utilizing bi-static Radio Frequency (RF) scattering and propagation with precision			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
frequency, phase, and power management. This space communications capability will develop and demonstrate multiple advanced Army LEO space communications concepts and will also assess interfacing with multiple Joint Service space communication missions. The APNT CFT will execute $5.0M of these funds in FY 2021 ***FY 2021 Plans:*** Assess performance of space communications capabilities of multiple advanced Army LEO space communications concepts and interfacing with multiple Joint Services. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Transfer from PE 1206308A FE5 to PE 0603308A Project 990 funding in FY 2021.			
Accomplishments/Planned Programs Subtotals	-	-	26.230

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603308A / *Army Space Systems Integration*	Project (Number/Name) 990 / *Space And Missile Defense Integration*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Personnel and Operations support	TBD	SMDC/ARSTRAT Huntsville, AL and Colorado Springs; SMDC/ARSTRAT Huntsville, AL and Colorado Spring : Huntsville, AL and Colorado Spring, CO	-	-		-		21.230		-		21.230	0.000	21.230	-
		Subtotal	-	-		-		21.230		-		21.230	0.000	21.230	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
APNT Integrated Space Communications0	TBD	Various : Huntsville AL, Wilmington, MA, Boulder CO, VA	-	-		-		5.000		-		5.000	0.000	5.000	-
		Subtotal	-	-		-		5.000		-		5.000	0.000	5.000	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		26.230		-		26.230	0.000	26.230	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

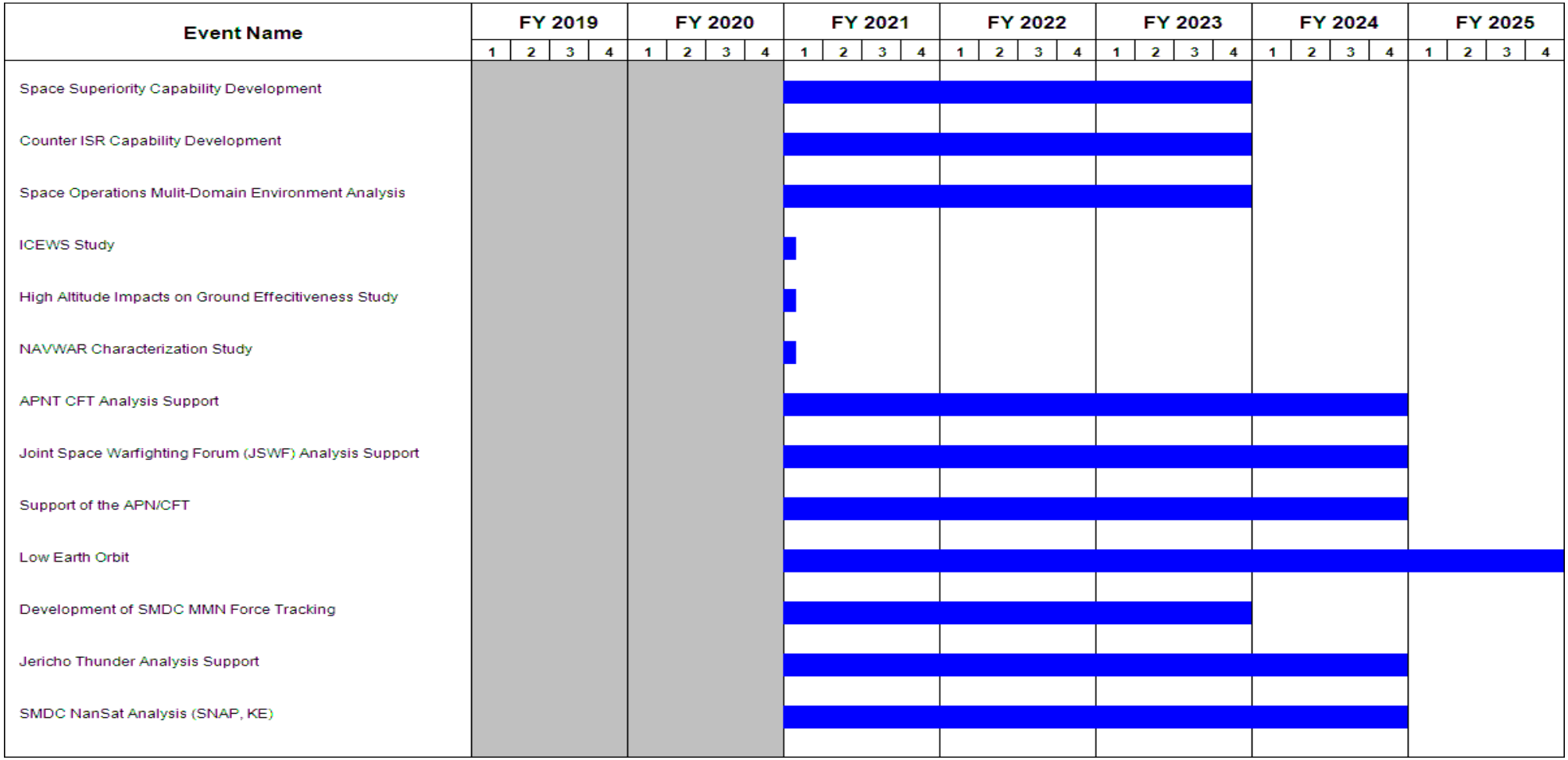

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

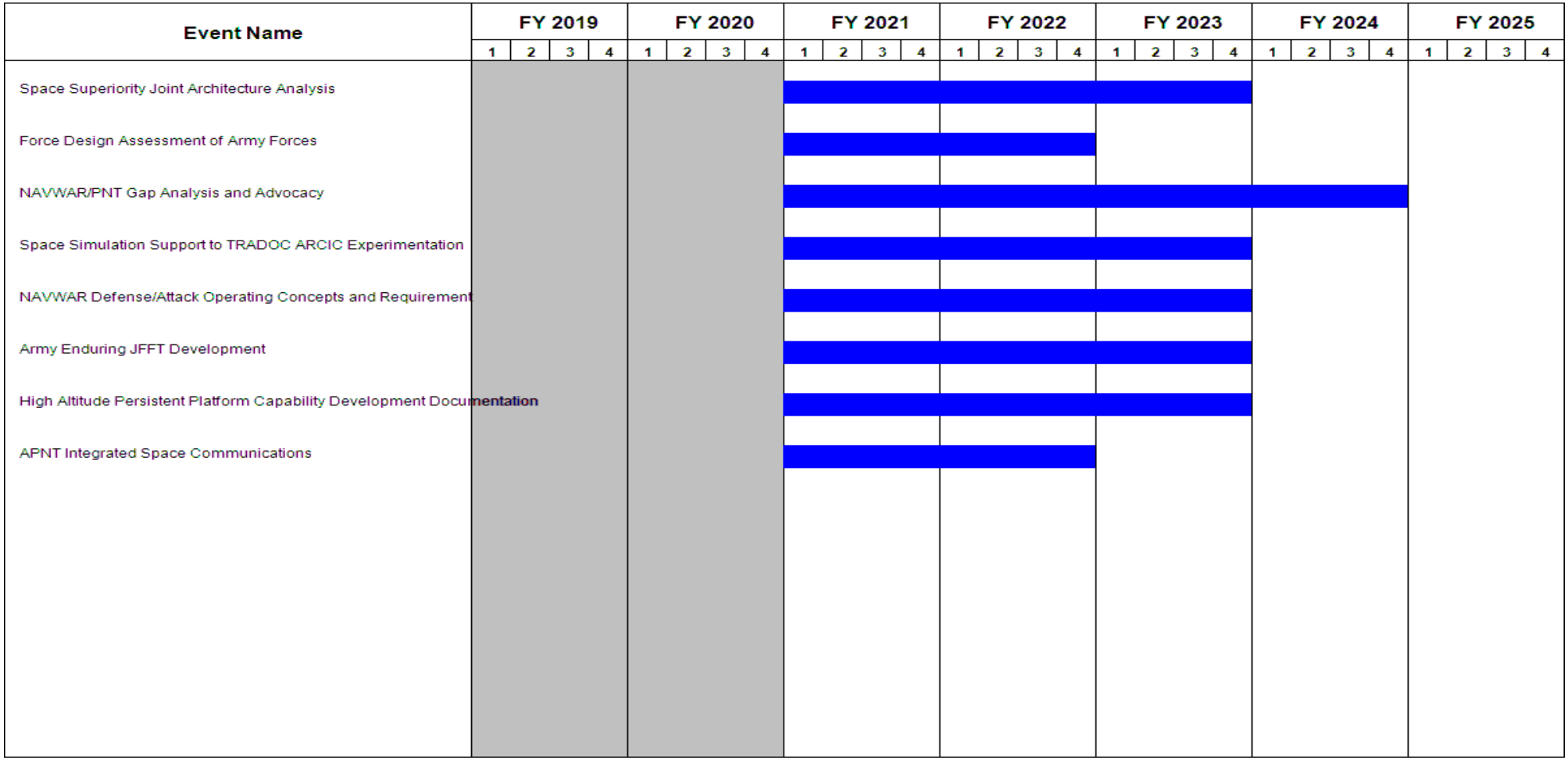

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603308A / *Army Space Systems Integration*	**Project (Number/Name)** 990 / *Space And Missile Defense Integration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Space Superiority Capability Development	1	2021	4	2023
Counter ISR Capability Development	1	2021	4	2023
Space Operations Mulit-Domain Environment Analysis	1	2021	4	2023
ICEWS Study	1	2021	1	2021
High Altitude Impacts on Ground Effecitiveness Study	1	2021	1	2021
NAVWAR Characterization Study	1	2021	1	2021
APNT CFT Analysis Support	1	2021	4	2024
Joint Space Warfighting Forum (JSWF) Analysis Support	1	2021	4	2024
Support of the APN/CFT	1	2021	4	2024
Low Earth Orbit	1	2021	4	2025
Development of SMDC MMN Force Tracking	1	2021	4	2023
Jericho Thunder Analysis Support	1	2021	4	2024
SMDC NanSat Analysis (SNAP, KE)	1	2021	4	2024
Space Superiority Joint Architecture Analysis	1	2021	4	2023
Force Design Assessment of Army Forces	1	2021	4	2022
NAVWAR/PNT Gap Analysis and Advocacy	1	2021	4	2024
Space Simulation Support to TRADOC ARCIC Experimentation	1	2021	4	2023
NAVWAR Defense/Attack Operating Concepts and Requirement	1	2021	4	2023
Army Enduring JFFT Development	1	2021	4	2023
High Altitude Persistent Platform Capability Development Documentation	1	2021	4	2023
APNT Integrated Space Communications	1	2021	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603327A *I Air and Missile Defense Systems Engineering*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	44.743	52.980	26.482	0.500	26.982	0.500	0.000	0.000	0.000	Continuing	Continuing
FG9: *Air and Missile Defense (AMD) Electronic Warfare*	-	44.743	52.980	26.482	0.500	26.982	0.500	0.000	0.000	0.000	Continuing	Continuing

Note

Beginning in FY 2020, the Army Long-Range Persistent Surveillance (ALPS) system efforts transition to Program Element 0604741A, Project 126.

A. Mission Description and Budget Item Justification

Funding in this program supports Cyber and Electromagnetic Activities (CEMA) efforts to conduct operational realistic assessments of Army Integrated Fires performance, identify system vulnerabilities, and develop mitigations against threats across the Cyber and Electromagnetic spectrum. Army radars and sensors, integrated air and missile defense mission command and fire control, Radio Frequency (RF) data and voice networks, and Positioning, Navigation, and Timing (PNT) technology will be assessed against current and postulated threat systems and techniques. Potential solutions developed by the Army, other Services, and Defense agencies (for example Missile Defense Agency) to close identified gaps will be demonstrated and assessed in live and simulated CEMA environments. Assessment events will be conducted approximately every two years. Implementation of potential solutions will occur between events using system-specific funding. The proposed solutions will then be assessed at the next event after implementation.

Included in this line are funds to plan and execute periodic CEMA activities with Army Integrated Fires systems, to include other Service and other Agency radar and sensor systems as appropriate. Upon completion of CEMA demonstration analyses, funding will facilitate initial recommendations for potential mitigations and solutions to Army sensors, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army radar and sensor systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army CEMA concepts in Hardware-In-The-Loop (HWIL) environment. Additionally, virtual models of critical hardware and software are being developed and implemented to allow for destructive testing with advanced CEMA threats in a lab environment. There will be continual interface with intelligence communities to maintain cognizance of emerging CEMA threats and incorporate these threats in future CEMA demonstrations. These activities follow a time-phased roadmap that identifies the investments needed to improve the resiliency of Army radar and sensors, C2, and RF data and voice networks in contested CEMA environments.

FY 2021 base funding of $26.482 million will be used to plan and execute the FY 2021 Survivability Exercise to assess the performance of the Army Integrated Fires architecture, with Joint participants, in a live, tactically relevant, contested CEMA environment. Funds will be used to analyze the performance data of the FY 2021 Survivability Exercise participant weapon systems, identify vulnerabilities, and develop rapid mitigation concepts. Additionally, the funds will be used to execute Cyber Table Tops, continue the development of virtualized critical hardware and software, conduct destructive cyber vulnerability assessments, and integrate artificial intelligence and machine learning into weapon systems to mitigate current and future CEMA threats. FY 2021 OCO funding of $.500 million will be used to complete operational assessment of ALPS prototype systems in support of a Combatant Commander.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603327A *I Air and Missile Defense Systems Engineering*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	46.231	15.648	27.008	-	27.008
Current President's Budget	44.743	52.980	26.482	0.500	26.982
Total Adjustments	-1.488	37.332	-0.526	0.500	-0.026
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-7.668			
• Congressional Rescissions	-	-			
• Congressional Adds	-	45.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.488	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.526	0.500	-0.026

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: FG9: *Air and Missile Defense (AMD) Electronic Warfare*		
Congressional Add: *Interoperability of integrated air and missile defense.*	20.000	15.000
Congressional Add: *Artificial Intelligence and Machine Learning*	-	25.000
Congressional Add: *Cyber and Supply Chain Resiliency*	-	5.000
Congressional Add Subtotals for Project: FG9	20.000	45.000
Congressional Add Totals for all Projects	20.000	45.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603327A / *Air and Missile Defense Systems Engineering*	Project (Number/Name) FG9 / *Air and Missile Defense (AMD) Electronic Warfare*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FG9: *Air and Missile Defense (AMD) Electronic Warfare*	-	44.743	52.980	26.482	0.500	26.982	0.500	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Beginning in FY 2020, the Army Long-Range Persistent Surveillance (ALPS) system efforts transition to Program Element 0604741A, Project 126.

A. Mission Description and Budget Item Justification

Funding in this program supports Cyber and Electromagnetic Activities (CEMA) efforts to conduct operational realistic assessments of Army Integrated Fires performance, identify system vulnerabilities, and develop mitigations against threats across the Cyber and Electromagnetic spectrum. Army radars and sensors, integrated air and missile defense mission command and fire control, Radio Frequency (RF) data and voice networks, and Positioning, Navigation, and Timing (PNT) technology will be assessed against current and postulated threat systems and techniques. Potential solutions developed by the Army, other Services, and Defense agencies (for example Missile Defense Agency) to close identified gaps will be demonstrated and assessed in live and simulated CEMA environments. Assessment events will be conducted approximately every two years. Implementation of potential solutions will occur between events using system-specific funding. The proposed solutions will then be assessed at the next event after implementation.

Included in this line are funds to plan and execute periodic CEMA activities with Army Integrated Fires systems, to include other Service and other Agency radar and sensor systems as appropriate. Upon completion of CEMA demonstration analyses, funding will facilitate initial recommendations for potential mitigations and solutions to Army sensors, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army radar and sensor systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army CEMA concepts in Hardware-In-The-Loop (HWIL) environment. Additionally, virtual models of critical hardware and software are being developed and implemented to allow for destructive testing with advanced CEMA threats in a lab environment. There will be continual interface with intelligence communities to maintain cognizance of emerging CEMA threats and incorporate these threats in future CEMA demonstrations. These activities follow a time-phased roadmap that identifies the investments needed to improve the resiliency of Army radar and sensors, C2, and RF data and voice networks in contested CEMA environments.

FY 2021 base funding of $26.482 million will be used to plan and execute the FY 2021 Survivability Exercise to assess the performance of the Army Integrated Fires architecture, with Joint participants, in a live, tactically relevant, contested CEMA environment. Funds will be used to analyze the performance data of the FY 2021 Survivability Exercise participant weapon systems, identify vulnerabilities, and develop rapid mitigation concepts. Additionally, the funds will be used to execute Cyber Table Tops, continue the development of virtualized critical hardware and software, conduct destructive cyber vulnerability assessments, and integrate artificial intelligence and machine learning into weapon systems to mitigate current and future CEMA threats. FY2021 OCO funding of $.500 million will be used to complete operational assessment of ALPS prototype systems in support of a Combatant Commander.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Advanced Electronic Protection Enhancements	24.743	7.641	26.482	0.500	26.982
Description: Provides Cyber and Electromagnetic Activities (CEMA) planning, conducts CEMA demonstrations and post-mission analysis. ***FY 2020 Plans:*** Funding will be provided for continued system analysis to identify and recommend rapid mitigation concepts following the P-12 event; initial planning and preparation activities for P-13; conduct a CEMA lab event (C Series) with a virtualized AIAMD systems of systems architecture to measure system and mission performance against advanced destructive cyber and electromagnetic threats; continue development of algorithm based solutions to identify, characterize, and mitigate performance impacts of CEMA threats; update the Cyber and Electromagnetic Activities (CEMA) roadmap and strategy to ensure coordination and execution of prioritized goals; and to continue virtualization of additional AIAMD sensors, launchers, C2, and supporting architecture. ***FY 2021 Base Plans:*** Funds will be used to plan and execute the FY 2021 Survivability Exercise to assess the performance of the Army Integrated Fires architecture, with Joint participants, in a live, tactically relevant, contested CEMA environment. Funds will be used to analyze the performance data of the FY 2021 Survivability Exercise participant weapon systems, identify vulnerabilities, and develop rapid mitigation concepts. Additionally, the funds will be used to execute Cyber Table Tops, continue the development of virtualized critical hardware and software, conduct destructive cyber vulnerability assessments, and integrate artificial intelligence and machine learning into weapon systems to mitigate current and future CEMA threats. ***FY 2021 OCO Plans:*** Funds will be used to continue an operational assessment of ALPS prototype systems in support of a Combatant Commander identified need. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The funding decreases from FY 2020 to FY 2021 due to completion of Artificial Intelligence/Machine Learning and Cyber and Supply Chain Resiliency efforts.					
Title: FY 2020 SBIR/STTR Transfer	-	0.339	-	-	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	24.743	7.980	26.482	0.500	26.982

	FY 2019	FY 2020
Congressional Add: Interoperability of integrated air and missile defense. ***FY 2019 Accomplishments:*** Interoperability of integrated air and missile defense. ***FY 2020 Plans:*** Interoperability of integrated air and missile defense.	20.000	15.000
Congressional Add: Artificial Intelligence and Machine Learning ***FY 2020 Plans:*** Artificial Intelligence and Machine Learning	-	25.000
Congressional Add: Cyber and Supply Chain Resiliency ***FY 2020 Plans:*** Cyber and Supply Chain Resiliency	-	5.000
Congressional Adds Subtotals	20.000	45.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Assessment events will be conducted approximately every two years in live and simulated CEMA environments. In addition to Government planning and conduct of assessments, funding will also be provided through various contracts for subject matter expertise.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Program Management	Various	Various : Various	2.831	1.688	Nov 2018	0.907	Nov 2019	0.926	Nov 2020	-		0.926	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.339		-		-		-	0.000	0.339	-
		Subtotal	2.831	1.688		1.246		0.926		-		0.926	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Integration Assessment	Various	Various : Various	1.538	2.840	Nov 2018	2.673	Nov 2019	2.934	Nov 2020	-		2.934	Continuing	Continuing	Continuing
Interoperabiity of Integrated AMD	SS/CPFF	Various : Various	15.000	20.000	Feb 2019	14.957	Feb 2020	-		-		-	0.000	49.957	-
Cyber and Supply Chain Resiliency	Various	Various : Various	-	-		3.273	Mar 2020	-		-		-	0.000	3.273	-
Artificial Intelligence and Machine Learning	Various	Various : Various	-	-		14.667	Feb 2020	-		-		-	0.000	14.667	-
ALPS Development/ Integration	Various	Various : Various	28.831	7.495	Jan 2019	0.458	Jan 2020	0.000		0.500	Jan 2020	0.500	0.000	37.284	-
		Subtotal	45.369	30.335		36.028		2.934		0.500		3.434	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Component Assessments & Research and Trade Studies	Various	Various : Various	12.512	5.850	Feb 2019	10.982	Feb 2020	12.801	Feb 2021	-		12.801	Continuing	Continuing	Continuing
		Subtotal	12.512	5.850		10.982		12.801		-		12.801	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Demonstration Planning and Execution	Various	Various : Various	4.200	6.870	Nov 2018	4.724	Nov 2019	9.821	Nov 2020	-		9.821	Continuing	Continuing	Continuing
		Subtotal	4.200	6.870		4.724		9.821		-		9.821	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	64.912	44.743		52.980		26.482		0.500		26.982	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*

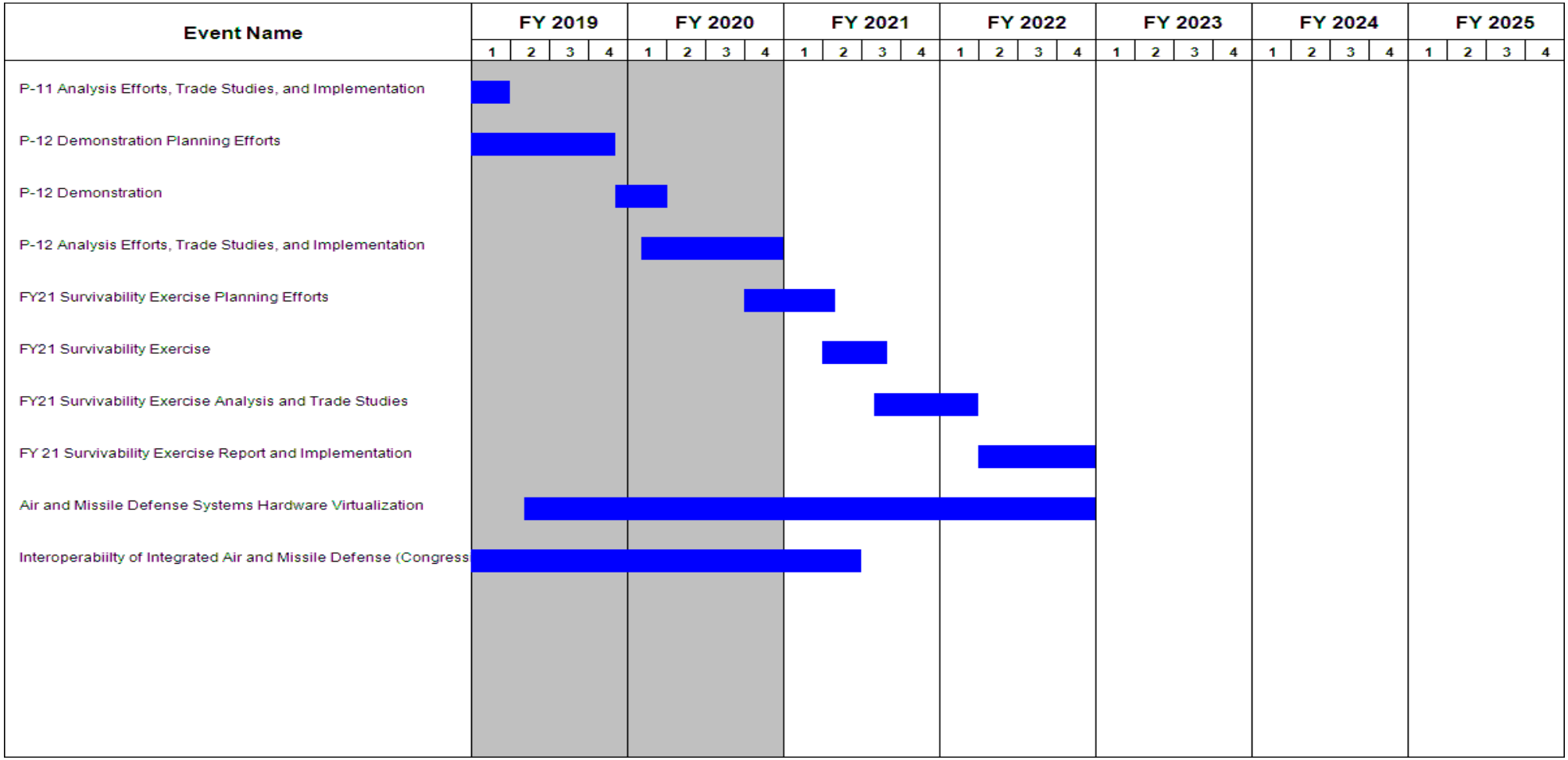

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603327A / *Air and Missile Defense Systems Engineering*	**Project (Number/Name)** FG9 / *Air and Missile Defense (AMD) Electronic Warfare*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
P-11 Demonstration	2	2018	3	2018
P-11 Analysis Efforts, Trade Studies, and Implementation	3	2018	1	2019
P-12 Demonstration Planning Efforts	4	2018	4	2019
P-12 Demonstration	4	2019	1	2020
P-12 Analysis Efforts, Trade Studies, and Implementation	1	2020	4	2020
FY21 Survivability Exercise Planning Efforts	4	2020	2	2021
FY21 Survivability Exercise	2	2021	3	2021
FY21 Survivability Exercise Analysis and Trade Studies	3	2021	1	2022
FY 21 Survivability Exercise Report and Implementation	2	2022	4	2022
Air and Missile Defense Systems Hardware Virtualization	2	2019	4	2022
Interoperabiilty of Integrated Air and Missile Defense (Congressional Adds)	4	2018	2	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603619A *I Landmine Warfare and Barrier - Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	40.255	82.915	64.092	-	64.092	44.621	60.843	44.437	16.423	Continuing	Continuing
606: *Cntrmn/Barrier Adv Dev*	-	2.869	0.000	0.000	-	0.000	0.000	4.947	4.578	9.935	0.000	22.329
BU5: *Standoff Volcano Obstacle (SAVO) Adv Tech*	-	0.000	12.983	6.956	-	6.956	0.000	0.000	0.000	0.000	0.000	19.939
EK7: *Area Denial Capability Development*	-	37.386	69.932	57.136	-	57.136	44.621	55.896	39.859	6.488	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) provides for the Concept Exploration and Refinement of Terrain Shaping Obstacles and develops modernized alternatives to the Family of Scatterable Mines systems.

Project 606 Countermine/Barrier Advanced Development enables development and evaluation of technologies that will perform detection, neutralization, and clearing of landmines and Improvised Explosive Devices (IEDs) at operational speeds. The Forward Reconnaissance and Explosive Hazard Detection (FREHD) system is a suite of four capabilities for use by route clearance patrols to provide standoff detection of explosive hazards: vehicle-mounted anomaly detection; pinpoint explosive hazard detection; explosive hazard vapor and particle detection; and remote visualization. FREHD increases the rate of advance of the route clearance formation while removing Soldiers and equipment from the proximity of blast and fragmentation.

Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap and has been identified as a part of the Army Modernization Strategy. SAVO will utilize a Middle Tier of Acquisition approach for Rapid Prototyping and Fielding in accordance with Section 804 of the 2016 National Defense Authorization Act (NDAA). SAVO supports a United States Army Europe (USAREUR) Operational Needs Statement (ONS) ONS # 18-22702 as well as a revision to the Multiple Delivery Mine System (Volcano) Joint Service Operational Requirement (JSOR) # 0683. This capability will allow for a formation of pre-emplaced directed obstacles that can be initiated remotely via fielded wired or wireless initiation systems. If the emplaced obstacle is not initiated, SAVO can be recovered for future re-deployment. SAVO consists of a newly developed base plate from which the existing stock of National Landmine Policy compliant munitions (M87A1 Volcano canisters) can be launched. SAVO can be initiated via three fielded systems; the M7 Spider Networked Munition System, the MK152/M156 Remote Activation Munition Systems (RAMS), or the CD450-4J Blasting Machine. Fiscal Year (FY) 2021 funding resources the continued execution of the SAVO Rapid Prototyping activities in preparation for transition to the Rapid Fielding phase.

Project EK7 Area Denial Capability Development provides for the advanced capability development of terrain shaping obstacle systems and develops modernized alternatives to the Family of Scatterable Mines. The project will evaluate integrated technologies and develop prototype systems in a realistic operating environment for the next generation of Terrain Shaping Obstacles (TSO). TSO will deny the enemy terrain and freedom of action in a joint, multi-domain, high-intensity conflict while allowing friendly forces to maneuver freely within the same battle space. TSO may include multiple methods of defeat to include top attack and bottom attack and provide controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. TSO enables the Combatant

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603619A *I Landmine Warfare and Barrier - Adv Dev*

Commander to shape the battle space without exposing friendly forces to enemy engagement. This capability supports Army Modernization priorities as a critical enabler for soldier lethality and creates targets for long range precision fires within the engagement area. TSO will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements. TSO supports a United States Army Europe (USAREUR) Operational Needs Statement (ONS) # 18-22702.

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B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	45.198	92.915	6.963	-	6.963
Current President's Budget	40.255	82.915	64.092	-	64.092
Total Adjustments	-4.943	-10.000	57.129	-	57.129
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-10.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-4.943	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	57.129	-	57.129

Change Summary Explanation

FY 2021 funding increase in the amount of $57.191 million due to realignment from Program Element (PE) 0604808A Landmine Warfare/Barrier - Eng Dev due to change in acquisition strategy.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) 606 / *Cntrmn/Barrier Adv Dev*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
606: *Cntrmn/Barrier Adv Dev*	-	2.869	0.000	0.000	-	0.000	0.000	4.947	4.578	9.935	0.000	22.329
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 606 Countermine/ Barrier Advanced Development enables development and evaluation of technologies that will perform detection, neutralization, and clearing of landmines and Improvised Explosive Devices (IEDs) at operational speeds.

The Forward Reconnaissance and Explosive Hazard Detection (FREHD) system is a suite of four capabilities for use by route clearance patrols to provide standoff detection of explosive hazards: vehicle-mounted anomaly detection; pinpoint explosive hazard detection; explosive hazard vapor and particle detection; and remote visualization. FREHD increases the rate of advance of the route clearance formation while removing Soldiers and equipment from the proximity of blast and fragmentation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Forward Reconnaissance and Explosive Hazard Detection (FREHD)	2.869	-	-
Description: The Forward Reconnaissance and Explosive Hazard Detection (FREHD) system is a suite of four capabilities for use by route clearance patrols to provide standoff detection of explosive hazards: vehicle-mounted anomaly detection; pinpoint explosive hazard detection; explosive hazard vapor and particle detection; and remote visualization. FREHD increases the rate of advance of the route clearance formation while removing Soldiers and equipment from the proximity of blast and fragmentation. FREHD enables development and evaluation of technologies that will perform detection, neutralization, and clearing of landmines and Improvised Explosive Devices (IEDs) at operational speeds.			
Accomplishments/Planned Programs Subtotals	2.869	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 415: *Mine Neutral/Detection*	31.807	17.910	1.998	-	1.998	5.995	6.994	-	-	Continuing	Continuing
• R64001: *HUSKY MOUNTED DETECTION SYSTEM (HMDS)*	35.834	75.586	109.069	-	109.069	76.800	-	-	-	0.000	297.289
• R64002: *HMDS - GROUND PENETRATING RADAR*	35.834	46.204	24.853	-	24.853	12.609	-	-	-	0.000	119.500
• R64003: *HMDS - DEEP BURIED DETECTION*	-	29.382	84.216	-	84.216	64.191	-	-	-	0.000	177.789

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** 606 / *Cntrmn/Barrier Adv Dev*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

PE 0604808 Landmine Warfare/Barrier - Eng Dev Project 415 Mine Neutralization and Detection is the engineering development follow-on to this funding line, and is a shared project line. The above profile represents the total line and all combined efforts.

D. Acquisition Strategy

The Husky Mounted Detection System (HMDS) program is pursuing an acquisition approach that delivers capability increments - Increment A, Configuration 1 (A1) to the Warfighter by leveraging the Quick Reaction Capability (QRC) Ground Penetrating Radar (GPR) currently deployed in support of Operation Enduring Freedom (OEF) and Operation Inherent Resolve (OIR). In FY 2020, the program will complete execution of an Engineering Change Proposals (ECP) to add a wire detection capability to address evolving threat, and Infrared illumination to enable nighttime operation, improve operational availability of the HMDS during inclement weather and address obsolescence and Cyber Security deficiencies.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) 606 / *Cntrmn/Barrier Adv Dev*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management - HMDS	MIPR	PM Terrestrial Sensors : Fort Belvoir, VA	0.300	-		-		-		-		-	0.000	0.300	-
		Subtotal	0.300	-		-		-		-		-	0.000	0.300	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS To Be Determined	TBD	TBD : TBD	0.780	-		-		-		-		-	0.000	0.780	-
		Subtotal	0.780	-		-		-		-		-	0.000	0.780	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS Explosive Hazard Detection - Technology Analysis	MIPR	TRADOC : Ft. Eustis, VA	0.488	-		-		-		-		-	0.000	0.488	-
HMDS Explosive Hazard Detection - Engineering Support	MIPR	CERDEC NVESD : Ft. Belvoir, VA	1.115	-		-		-		-		-	0.000	1.115	-
HMDS Explosive Hazard Detection - System Analysis and Test Design	FFRDC	IDA : Alexandria, VA	0.230	-		-		-		-		-	0.000	0.230	-
FREHD	MIPR	Various : Various	-	2.869	Mar 2019	-		-		-		-	0.000	2.869	-
		Subtotal	1.833	2.869		-		-		-		-	0.000	4.702	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) 606 / *Cntrmn/Barrier Adv Dev*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS Explosive Hazard Detection	MIPR	ATEC : Alexandria, VA	0.274	-		-		-		-		-	0.000	0.274	-
		Subtotal	0.274	-		-		-		-		-	0.000	0.274	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.187	2.869		0.000		-		-		-	0.000	6.056	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** 606 / *Cntrmn/Barrier Adv Dev*

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
HMDS/FREHD																												

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** 606 / *Cntrmn/Barrier Adv Dev*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
HMDS/FREHD	1	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BU5: *Standoff Volcano Obstacle (SAVO) Adv Tech*	-	0.000	12.983	6.956	-	6.956	0.000	0.000	0.000	0.000	0.000	19.939
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap and has been identified as a part of the Army Modernization Strategy. SAVO will utilize a Middle Tier of Acquisition approach for Rapid Prototyping and Fielding in accordance with Section 804 of the 2016 National Defense Authorization Act (NDAA). SAVO supports a United States Army Europe (USAREUR) Operational Needs Statement (ONS) ONS # 18-22702 as well as a revision to the Multiple Delivery Mine System (Volcano) Joint Service Operational Requirement (JSOR) # 0683. This capability will allow for a formation of pre-emplaced directed obstacles that can be initiated remotely via fielded wired or wireless initiation systems. If the emplaced obstacle is not initiated, SAVO can be recovered for future re-deployment. SAVO consists of a newly developed base plate from which the existing stock of National Landmine Policy compliant munitions (M87A1 Volcano canisters) can be launched. SAVO can be initiated via three fielded systems; the M7 Spider Networked Munition System, the MK152/M156 Remote Activation Munition Systems (RAMS), or the CD450-4J Blasting Machine. Fiscal Year (FY) 2021 funding resources the continued execution of the SAVO Rapid Prototyping activities in preparation for transition to the Rapid Fielding phase.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: SAVO Rapid Prototyping	-	9.303	3.103
Description: SAVO system Rapid Prototyping phase. ***FY 2020 Plans:*** Performed SAVO system Rapid Prototyping phase to include; Initiation of new start effort, development of system design, conducted requirements review, development of test and evaluation hardware configurations and fabrication of prototype systems for test and evaluation. ***FY 2021 Plans:*** Continue to perform the SAVO system Rapid Prototyping phase to include: continuation of Rapid Prototyping efforts, completion of design review, qualification testing, and operational assessment. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease supports the budget being aligned to an independent cost estimate for the scope of work.			
Title: Engineering Support	-	0.202	2.614
Description: Provide Engineering Support.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Performed OGA and contract engineering support to the Integrated Product Team supporting the Rapid Prototyping effort. ***FY 2021 Plans:*** Continue to perform OGA and contract engineering support to the Integrated Product Team supporting the continued Rapid Prototyping effort. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding increase supports plan testing and operational assessment.			
Title: SAVO Management Services ***Description:*** Program Management and Support ***FY 2020 Plans:*** Performed program management of the SAVO program. ***FY 2021 Plans:*** Continue to perform program management of the SAVO program. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease aligns with anticipated level of effort.	-	1.285	0.318
Title: SAVO Test & Evaluation ***Description:*** Provides support to Contractor/Government test activities. ***FY 2020 Plans:*** Performed test and evaluation activities such as development of test and evaluation strategy and conduction of initial testing on the prototype systems. ***FY 2021 Plans:*** Continue to perform test and evaluation activities and conduction of testing on the prototype systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease aligns with anticipated level of effort.	-	1.603	0.921
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638	-	0.590	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	12.983	6.956

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

SAVO will utilize a Middle Tier of Acquisition approach for Rapid Prototyping and Fielding acquisition approach in accordance with Section 804 of the 2016 NDAA. The Rapid Prototyping phase will utilize Other Transaction Authority. Prototypes will undergo a series of qualification and operational tests ahead of Initial Operational Capability scheduled for FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SAVO Program Management TDY and Support	MIPR	PM Close Combat Systems : Picatinny Arsenal, NJ	-	-		1.315	Jan 2020	0.240	Dec 2020	-		0.240	0.000	1.555	-
SAVO Contractor Support	C/FFP	BOWHEAD : Alexandria VA	-	-		-		0.078	Mar 2021	-		0.078	0.000	0.078	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.590		-		-		-	0.000	0.590	-
		Subtotal	-	-		1.905		0.318		-		0.318	0.000	2.223	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DOTC Manufacture Support	C/CPFF	TBD : TBD	-	-		6.332	Nov 2019	3.103	Oct 2020	-		3.103	0.000	9.435	-
		Subtotal	-	-		6.332		3.103		-		3.103	0.000	9.435	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CCDC Army Research Laboratory Human Research & Engineering (HRED) MANPRINT Support	MIPR	CCDC Army Research Laboratory - HRED : Aberdeen, MD	-	-		0.050	Jan 2020	0.015	Dec 2020	-		0.015	0.000	0.065	-
Contract Test and Engineering Support	C/CPFF	To Be Determined : To Be Determined	-	-		0.182	Jan 2020	-		-		-	0.000	0.182	-
SAVO - CCDC Armaments Center Engineering Support	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	-	-		2.882	Jan 2020	2.599	Dec 2020	-		2.599	0.000	5.481	-
		Subtotal	-	-		3.114		2.614		-		2.614	0.000	5.728	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Other Government Agencies and Support Contractors	MIPR	Army Test & Evaluation Command (ATEC) : Aberdeen, MD	-	-		1.632	May 2020	0.921	Apr 2021	-		0.921	0.000	2.553	-
		Subtotal	-	-		1.632		0.921		-		0.921	0.000	2.553	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		12.983		6.956		-		6.956	0.000	19.939	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*

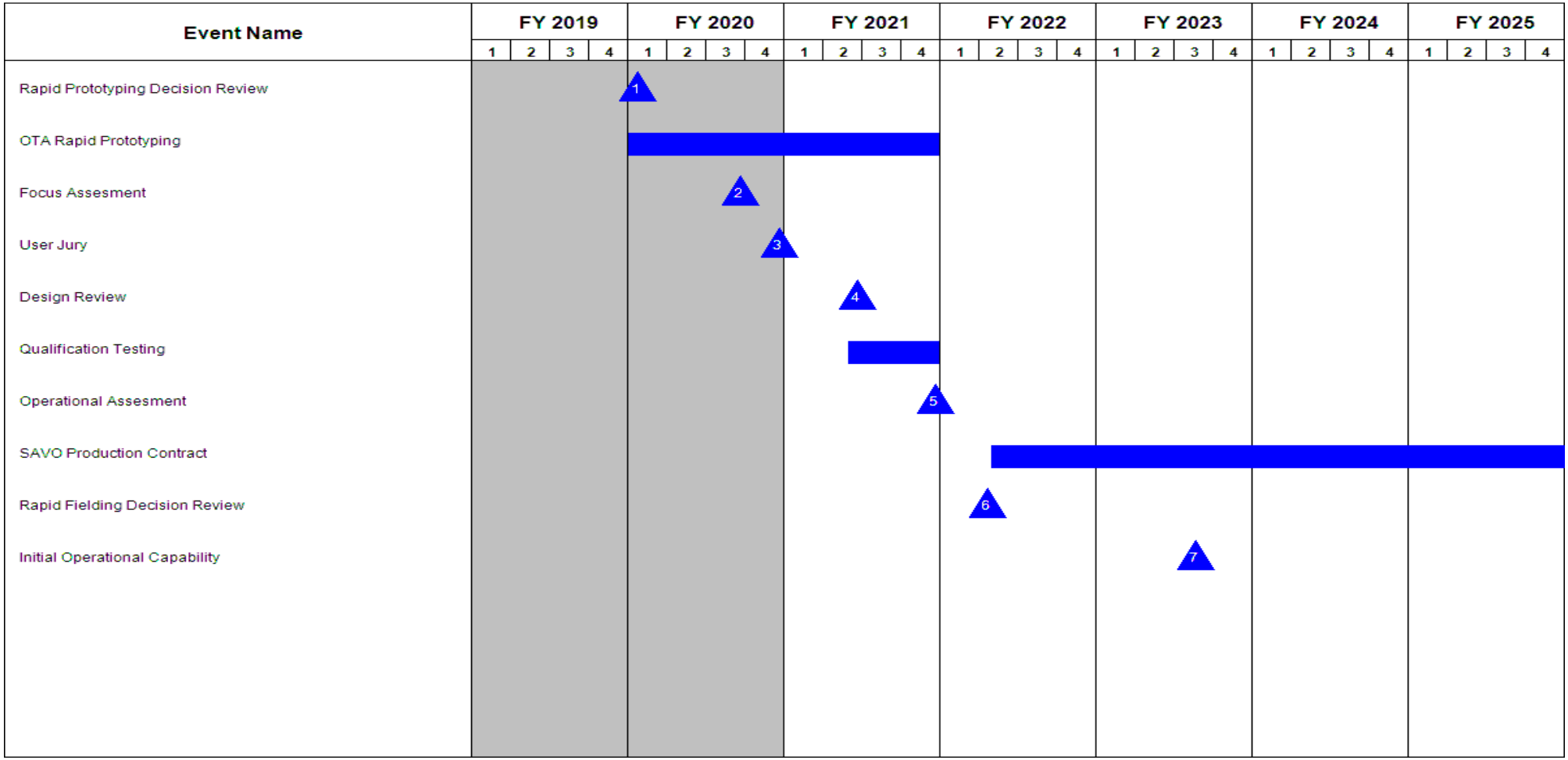

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** BU5 / *Standoff Volcano Obstacle (SAVO) Adv Tech*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Prototyping Decision Review	1	2020	1	2020
OTA Rapid Prototyping	1	2020	4	2021
Focus Assesment	3	2020	3	2020
User Jury	4	2020	4	2020
Design Review	2	2021	2	2021
Qualification Testing	2	2021	4	2021
Operational Assesment	4	2021	4	2021
SAVO Production Contract	2	2022	2	2026
Rapid Fielding Decision Review	2	2022	2	2022
Initial Operational Capability	3	2023	3	2023
Full Operational Capability	2	2026	2	2026

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) EK7 / *Area Denial Capability Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EK7: *Area Denial Capability Development*	-	37.386	69.932	57.136	-	57.136	44.621	55.896	39.859	6.488	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project EK7 Area Denial Capability Development provides for the advanced capability development of terrain shaping obstacle systems and develops modernized alternatives to the Family of Scatterable Mines.

The project will evaluate integrated technologies and develop prototype systems in a realistic operating environment for the next generation of Terrain Shaping Obstacles (TSO). TSO will deny the enemy terrain and freedom of action in a joint, multi-domain, high-intensity conflict while allowing friendly forces to maneuver freely within the same battle space. TSO may include multiple methods of defeat to include top attack and bottom attack and provide controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. TSO enables the Combatant Commander to shape the battle space without exposing friendly forces to enemy engagement. This capability supports Army Modernization priorities as a critical enabler for soldier lethality and creates targets for long range precision fires within the engagement area. TSO will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements. TSO supports a United States Army Europe (USAREUR) Operational Needs Statement (ONS) # 18-22702.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Terrain Shaping Obstacles Capability Development	24.115	39.409	41.496
Description: Develop, build, and demonstrate Terrain Shaping Obstacle common munitions system. Demonstrate system in an operationally relevant environment. ***FY 2020 Plans:*** Conducted system level design, matured munitions technologies, matured obstacle delivery methods, integrated munitions into delivery system, matured system technology and reduced program technical and cost risk. ***FY 2021 Plans:*** Continue working towards the completion of common munition and dispenser launch module design, integrate munition with launcher, complete design verification and critical design review. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Fiscal Year (FY) 2021 funding decrease due to a change in acquisition strategy.			
Title: Engineering Support	9.154	4.446	7.310

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Provide engineering support for Terrain Shaping Capability. ***FY 2020 Plans:*** Provided engineering support for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts. ***FY 2021 Plans:*** Continue to provide engineering support for Terrain Shaping Obstacle common munition design, dispenser launch module design, integration, design verification, and design qualification. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease due to a change in acquisition strategy.			
Title: Program Management and Oversight ***Description:*** Program management and oversight of Terrain Shaping Obstacle Capability development and system evaluation. ***FY 2020 Plans:*** Provided program management and oversight for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts. Conducted long-range program planning, risk analysis, and program oversight. ***FY 2021 Plans:*** Continue to provide program management and oversight for munition development, dispenser launcher module development, integration, design verification, and design qualification. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease due to a change in acquisition strategy.	4.117	3.678	0.930
Title: Test & Evaluation ***Description:*** Conduct testing and evaluation of Terrain Shaping Obstacle Capability performance. ***FY 2020 Plans:*** Supported contractor led sub-system integration testing and prototype testing as needed. Conducted Preliminary Design Review (PDR). ***FY 2021 Plans:***	-	1.688	6.400

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Continue conducting government qualification testing to evaluate system capabilities and limitations for design qualification, reliability, and safety assessment. Conduct Critical Design Review (CDR). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding increase supports test hardware build and qualification testing of top attack capability.			
Title: TSO Future Capability Evaluation ***Description:*** Develop, build, and demonstrate technologies for future Terrain Shaping Obstacle (TSO) capabilities. ***FY 2020 Plans:*** Completed technology maturation and prototype development, investigated system and subsystem technology for advanced Terrain Shaping Obstacles (TSO) capability insertions. ***FY 2021 Plans:*** Continue to complete technology maturation and prototype development, investigate system and subsystem technology for advanced Terrain Shaping Obstacles (TSO) capability insertions. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding increase due to planned execution of multiple future capability insertions.	-	17.535	1.000
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	3.176	-
Accomplishments/Planned Programs Subtotals	37.386	69.932	57.136

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• E76740: *Close Terrain Shaping Obstacle*	-	-	4.995	-	4.995	30.369	47.953	37.963	10.989	0.000	132.269

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

D. Acquisition Strategy

The Dominating Mobility through Terrain Shaping and Engagement (DMTTS&E) Initial Capabilities Document (ICD) was approved by the Joint Requirements Oversight Council (JROC) on 3 October 2014. The DMTTS&E ICD documents Terrain Shaping Obstacle (TSO) capabilities at all operational ranges including those within line-of-sight and those that are beyond line-of-sight. The Army completed an Analysis of Alternatives and intends to initially develop a hand-emplaced Top Attack capability to be fielded at close operational ranges. The Army previously awarded two initiatives which developed and demonstrated prototypes of the top attack system concept. The Army will award a single contract to complete development and qualification of the initial top attack capability. To achieve the full capability, the Army intends to develop an improved top attack capability followed by a modernized bottom attack capability. The top attack and bottom attack systems will then be integrated and networked through the full network capability development. The munitions developed during the top attack and bottom attack phases will serve as the basis for the future mid-range and deep-range employed TSO capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) EK7 / *Area Denial Capability Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	PM-CCS : Picatinny Arsenal, NJ	1.535	1.893	Feb 2019	0.088	Jul 2020	0.337	Nov 2020	-		0.337	Continuing	Continuing	-
Scorpion Contract Closeout	MIPR	General Dynamics : TBD	-	0.305	Feb 2019	-		-		-		-	0.000	0.305	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		3.176		-		-		-	0.000	3.176	-
		Subtotal	1.535	2.198		3.264		0.337		-		0.337	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Top Attack Prototype Development A	SS/CPFF	Northrop Grumman Innovation Systems : Plymouth, MN	0.852	3.500	Mar 2019	-		-		-		-	0.000	4.352	-
Top Attack Prototype Development B	SS/CPFF	Textron Defense Systems : Wilmington, MA	0.949	13.360	Jul 2019	-		-		-		-	0.000	14.309	-
Technology Maturation Risk Reduction (TMRR) Development A	C/FFP	CCDC Armaments Research Center : Picatinny Arsenal, NJ	-	0.036	Feb 2019	-		-		-		-	0.000	0.036	-
Technology Maturation Risk Reduction (TMRR) Development B	C/FFP	CCDC Armaments Research Center : Picatinny Arsenal, NJ	-	0.036	Feb 2019	-		-		-		-	0.000	0.036	-
Common Component Communications Study	SS/CPFF	NAL Research Corporation : Manassas, Virginia	3.454	-		0.406	Feb 2020	-		-		-	0.000	3.860	-
Secure Communications Network	SS/CPFF	NGMS : Redondo Beach, CA	14.488	2.488		-		-		-		-	0.000	16.976	-
Common Secure Network Architecture	SS/CPFF	Textron Defense Systems : Wilmington, MA	14.488	3.477	Sep 2019	-		-		-		-	0.000	17.965	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) EK7 / *Area Denial Capability Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
User Evaluation Prototypes	C/FFP	CCDC Armaments Research Center : Picatinny Arsenal, NJ	-	0.214	Jun 2019	-		-		-		-	0.000	0.214	-
Top Attack Capability Development	C/CPFF	TBD : TBD	-	1.004		39.186		41.496	Dec 2020	-		41.496	0.000	81.686	-
Future Capability Evaluation	SS/FFP	CCDC Armaments Research Center : Picatinny Arsenal, NJ	-	-		17.944	Jun 2020	1.000		-		1.000	0.000	18.944	-
		Subtotal	34.231	24.115		57.536		42.496		-		42.496	0.000	158.378	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CCDC Armaments Center Engineering Support	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	5.578	6.808	Dec 2018	4.939	Jan 2020	5.160	Dec 2020	-		5.160	Continuing	Continuing	-
CCDC C5ISR Center Engineering Support	MIPR	CCDC C5ISR Center : Fort Belvoir, VA	0.889	1.000	Jan 2019	0.073	Jan 2020	0.260	Jan 2021	-		0.260	Continuing	Continuing	-
Mitre Engineering Support (C4)	FFRDC	Mitre : McLean, VA	-	0.634	Aug 2019	0.885	Aug 2020	1.145	Aug 2021	-		1.145	Continuing	Continuing	-
Fibertek, INC. Operational Contractor Support	C/CPFF	FIBERTEK, INC. : Herndon, VA	0.130	-		-		-		-		-	0.000	0.130	-
General Program Support	C/FFP	Millennium Corporation : Picatinny Arsenal, NJ	0.411	-		-		-		-		-	0.000	0.411	-
General Program Support	C/FFP	Bowhead : Picatinny Arsenal, NJ	-	0.556	Jun 2019	0.349	May 2020	0.593	Jun 2021	-		0.593	0.000	1.498	-
CCDC Army Research Laboratory Engineering Support	MIPR	CCDC Army Research Laboratory : Adelphi, MD	0.777	0.712	Jan 2019	0.578	Jan 2020	0.545	Jan 2021	-		0.545	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) EK7 / *Area Denial Capability Development*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Milestone Document Development Support	SS/FFP	Booze Allen Hamilton : Picatinny Arsenal, NJ	2.484	1.173	Feb 2019	0.293		-		-		-	0.514	4.464	-
CCDC C5ISR Center NVESD Engineering Support	MIPR	CCDC C5ISR Center : Fort Belvoir, VA	-	-		0.373	Jan 2020	-		-		-	Continuing	Continuing	-
Air Worthiness Certification	MIPR	AMRDEC : Redstone Arsenal, AL	-	0.010	Dec 2018	-		-		-		-	0.000	0.010	-
Integrated Logistics Support	MIPR	TACOM ILSC : Warren, MI	-	0.156	Jan 2019	-		-		-		-	0.000	0.156	-
Polaris Contractor Support	C/FFP	MSCOE : Ft Leonard Wood - MO	-	0.024	Aug 2019	-		-		-		-	0.000	0.024	-
Milestone Document Development Support	C/FFP	TBD : TBD	-	-		-		0.200		-		0.200	0.000	0.200	-
		Subtotal	10.269	11.073		7.490		7.903		-		7.903	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prototype Development Demonstration	MIPR	USAF 96th Test Squadron / OGEX : Eglin AFB, FL	-	-		0.773		6.400		-		6.400	Continuing	Continuing	-
Target Vehicle Refurbishment	MIPR	Yuma Proving Ground : Yuma Proving Ground, AZ	-	-		0.346	Jan 2020	-		-		-	0.000	0.346	-
TSO High Performance Computing, Common Scene Generator, Target Modeling	MIPR	Aberdeen Proving Ground : Aberdeen, MD	-	-		0.523	Jan 2020	-		-		-	0.000	0.523	-
		Subtotal	-	-		1.642		6.400		-		6.400	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	Project (Number/Name) EK7 / *Area Denial Capability Development*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	46.035	37.386		69.932		57.136		-		57.136	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

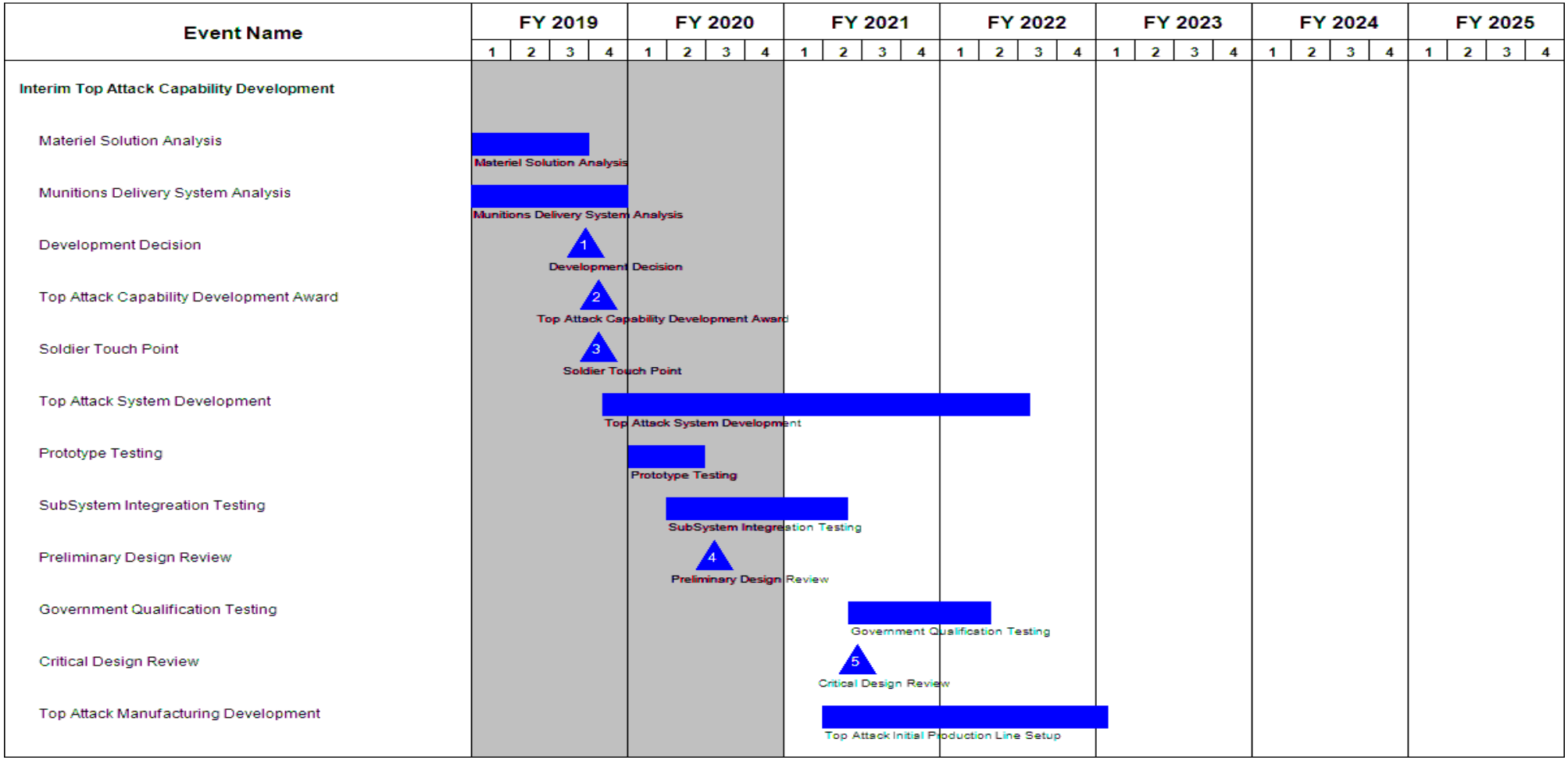

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

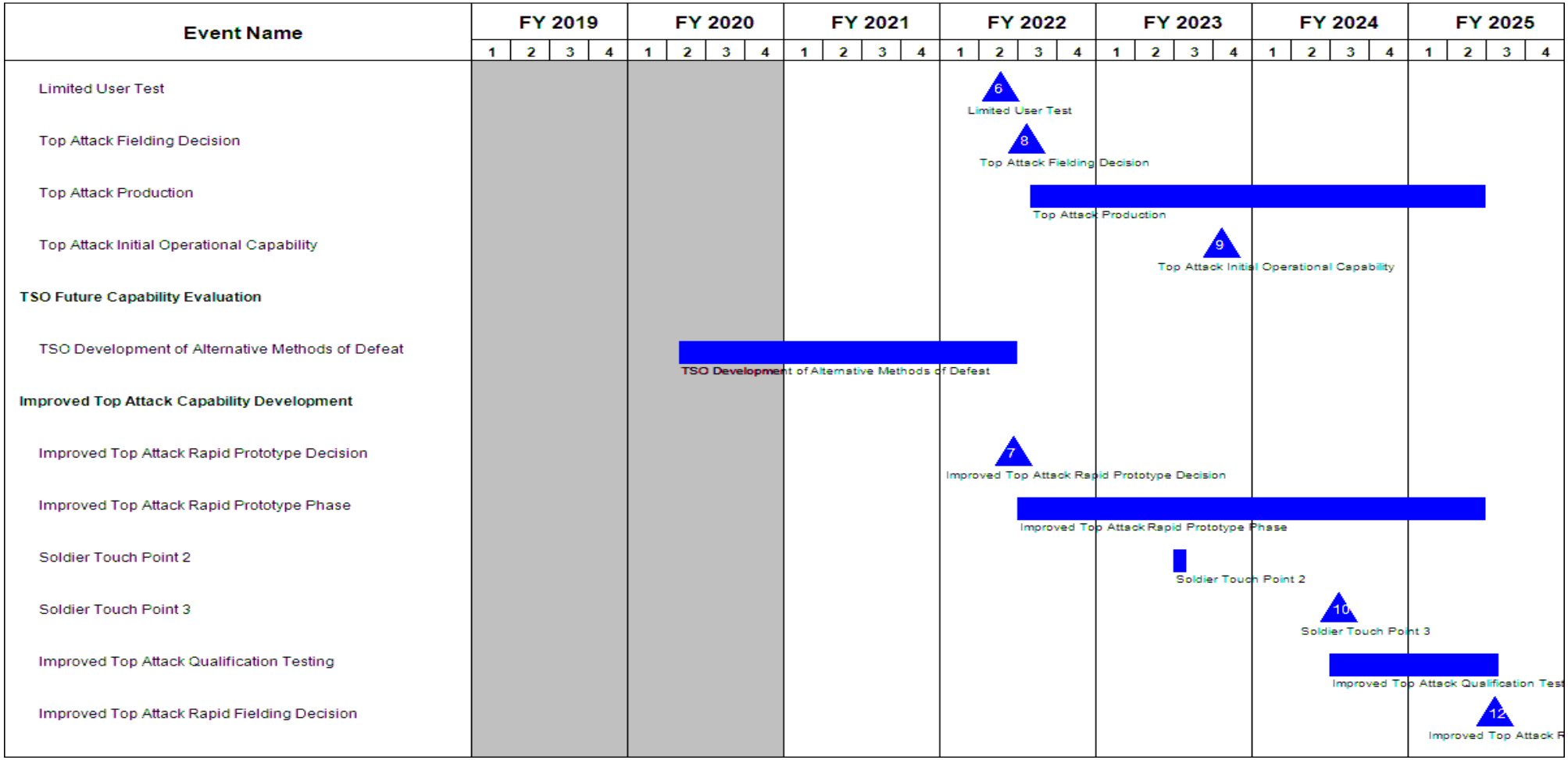

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

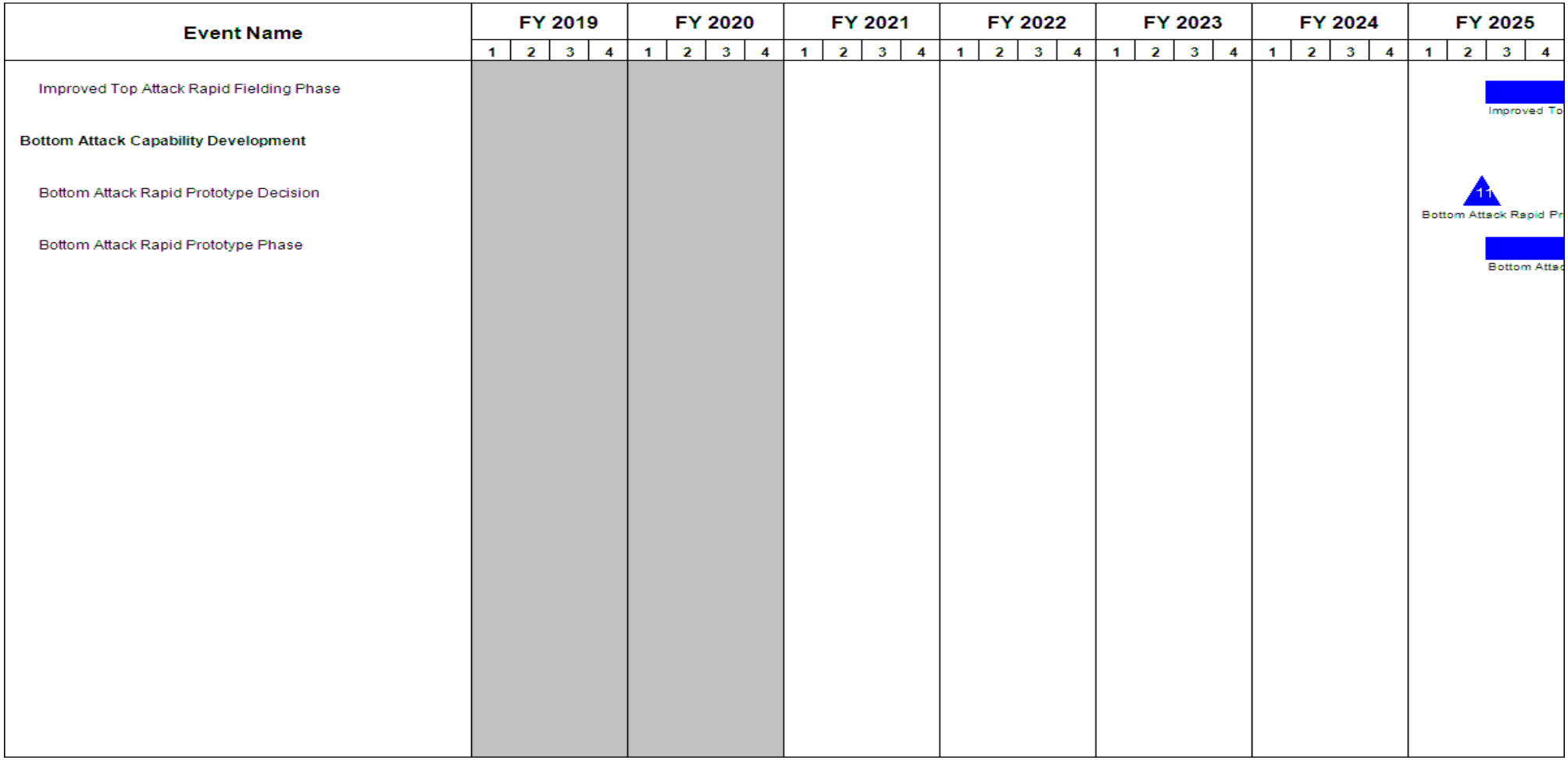

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Interim Top Attack Capability Development	2	2025	2	2025
Materiel Development Decision	4	2015	4	2015
Model and Simulation Development	1	2016	4	2018
Concept Prototype Agreements Award(s)	2	2016	2	2016
Concept Prototype Build	2	2016	4	2016
Concept Prototype Test and Evaluation	1	2017	1	2017
Analysis of Alternatives	1	2016	4	2016
Materiel Solution Analysis	1	2017	3	2019
Munitions Delivery System Analysis	4	2018	4	2019
Development Decision	3	2019	3	2019
Top Attack Capability Development Award	4	2019	4	2019
Soldier Touch Point	4	2019	4	2019
Top Attack System Development	4	2019	3	2022
Prototype Testing	1	2020	2	2020
SubSystem Integreation Testing	2	2020	2	2021
Preliminary Design Review	3	2020	3	2020
Government Qualification Testing	2	2021	2	2022
Critical Design Review	2	2021	2	2021
Top Attack Manufacturing Development	2	2021	1	2023
Limited User Test	2	2022	2	2022
Top Attack Fielding Decision	3	2022	3	2022
Top Attack Production	3	2022	2	2025

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603619A / *Landmine Warfare and Barrier - Adv Dev*	**Project (Number/Name)** EK7 / *Area Denial Capability Development*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Top Attack Initial Operational Capability	4	2023	4	2023
TSO Future Capability Evaluation	2	2020	2	2022
TSO Development of Alternative Methods of Defeat	2	2020	2	2022
Improved Top Attack Capability Development	2	2022	3	2029
Improved Top Attack Rapid Prototype Decision	2	2022	2	2022
Improved Top Attack Rapid Prototype Phase	3	2022	2	2025
Soldier Touch Point 2	3	2023	3	2023
Soldier Touch Point 3	3	2024	3	2024
Improved Top Attack Qualification Testing	3	2024	3	2025
Improved Top Attack Rapid Fielding Decision	3	2025	3	2025
Improved Top Attack Rapid Fielding Phase	3	2025	3	2029
Bottom Attack Capability Development	2	2025	2	2029
Bottom Attack Rapid Prototype Decision	2	2025	2	2025
Bottom Attack Rapid Prototype Phase	3	2025	3	2028

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603627A *I Smoke, Obscurant and Target Defeating Sys-Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	19.852	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	19.852
E79: *SMOKE/OBSCURANT SYSTEM*	-	19.852	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	19.852

Note

The Screening Obscuration Module (SOM) program will transition from Engineering and Manufacturing Development (EMD) to the Production and Deployment phase in Fiscal Year 2020.

A. Mission Description and Budget Item Justification

SOM will increase platform survivability and soldier protection levels of maneuver forces by degrading enemy forces ability to detect United States targets. The use of battlefield obscuration is a time-tested military tactic to protect personnel, vehicles, equipment, and structures from detection; and to screen the locations, activities, and actions of friendly forces. Commanders who employ obscuration enjoy greater tactical success, freedom of maneuver, and force protection. The SOM assists the Brigade Combat Team (BCT) in retaining freedom of maneuver, conducting breaching operations, breaking contact with the enemy during security operations, and deceiving the enemy of the BCT's intentions. The SOM accomplishes this by degrading enemy forces ability to detect U.S. targets in the visual and near infrared region of the electromagnetic spectrum. The SOM will provide a man portable mountable and dismountable medium area visual screening obscuration capability that can be applied to manned combat platforms and unmanned robotic systems. The individual Soldier or team will employ the SOM devices on open and complex terrain as part of cross-domain obscuration effects synchronized with land and air maneuver during cross-domain windows of advantage.

Chemical Biological Radiological and Nuclear (CBRN) Integrated Early Warning (IEW) requirements detailed in PACOM ONS 17-22580 (HQDA validated in Jan 2018). The capability developed in support of ONS 17-22580 will provide enhancements and integrated CBRN defense sensors to provide early warning of CBRN attacks and events, supplemented with decision support software. Increasing the level of confidence of information to the Commander, facilitating their ability to make critical time sensitive decisions with high confidence and low regret to mitigate and manage the impacts of CBRN hazards.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603627A *I Smoke, Obscurant and Target Defeating Sys-Adv Dev*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	20.674	0.000	0.000	-	0.000
Current President's Budget	19.852	0.000	0.000	-	0.000
Total Adjustments	-0.822	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.822	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	Project (Number/Name) E79 / *SMOKE/OBSCURANT SYSTEM*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
E79: *SMOKE/OBSCURANT SYSTEM*	-	19.852	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	19.852
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Screening Obscuration Module (SOM) will increase platform survivability and soldier protection levels of maneuver forces by degrading enemy forces' ability to detect United States targets. The use of battlefield obscuration is a time-tested military tactic to protect personnel, vehicles, equipment, and structures from detection and to screen the locations, activities, and actions of friendly forces. Commanders who employ obscuration achieve greater tactical success, freedom of maneuver, and force protection. The SOM assists the Brigade Combat Team (BCT) in retaining freedom of maneuver, conducting breaching operations, breaking contact with the enemy during security operations, and deceiving the enemy of the BCT's intentions. The SOM accomplishes this by degrading enemy forces' ability to detect U.S. targets in the visual and near infrared region of the electromagnetic spectrum. The SOM will provide a man-portable mountable and dismountable medium area visual screening obscuration capability that can be applied to manned combat platforms and unmanned robotic systems. The individual Soldier or team will employ the SOM devices on open and complex terrain as part of cross-domain obscuration effects synchronized with land and air maneuver during cross-domain windows of advantage.

Chemical Biological Radiological and Nuclear (CBRN) Integrated Early Warning (IEW) requirements detailed in PACOM ONS 17-22580 (HQDA validated in Jan 2018). The capability developed in support of ONS 17-22580 will provide enhancements and integrated CBRN defense sensors to provide early warning of CBRN attacks and events, supplemented with decision support software. As a result, the capability will increase the level of confidence of information to the Commander, facilitating his/her ability to make critical, time sensitive decisions with high confidence and low regret to mitigate and manage the impacts of CBRN hazards.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: SOM: Product Development ***Description:*** Provide Screening Obscuration Module (SOM) Development: Government and Contractor team will continue design and development of hardware in preparation for Government Development and User testing.	5.078	-	-
Title: SOM: Test, Evaluation & Other Government Agencies (OGA's) ***Description:*** Provide Test and Evaluation of SOM systems (Developmental and User testing to ensure effectiveness, suitability, survivability, and safety as a mounted and dismounted system).	1.749	-	-
Title: SOM: Project Management ***Description:*** Provide Project Management efforts.	0.516	-	-
Title: CBRN IEW	12.235	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	**Project (Number/Name)** E79 / *SMOKE/OBSCURANT SYSTEM*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: CBRN Theater Chemical and Biological Defense efforts.			
Title: SOM Support Costs	0.274	-	-
Accomplishments/Planned Programs Subtotals	19.852	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

SSN MX0600

D. Acquisition Strategy

Acquisition Strategy:

Screening Obscuration Module (SOM): The SOM acquisition strategy is a single-step System Integration and Development (SID) phase leading to a Milestone C production decision. A Full and Open Cost Plus Incentive Fee competitive contract was awarded and will be used to develop the SOM during the SID phase. Fixed Price Incentive (Successive Targets) options for production were included in the contract. The acquisition strategy includes system development and demonstration, full system integration, design for producibility and demonstration of interoperability, safety, military utility and reliability.

CBRN IEW: The $12.2 million in FY 2019, will address this rapid capability development, cyber security, qualification and performance test and evaluation (T&E) efforts. This funding will yield a Capability and Limitation Report in 1Q FY 2020 to support the deployment of the Full Operational Capability (FOC) in 2Q FY 2020

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	**Project (Number/Name)** E79 / *SMOKE/OBSCURANT SYSTEM*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SOM-Project Management Personnel	MIPR	JPM NBC CA : Edgewood, MD	8.796	0.532	Nov 2018	-		-		-		-	Continuing	Continuing	Continuing
JUONS CC-0557 Project Management Personnel	Various	JPM Guardian : Edgewood, MD	0.674	-		-		-		-		-	0.000	0.674	-
CBRN IEW	TBD	JPEO-CBRND : APG	-	1.000	Feb 2019	-		-		-		-	0.000	1.000	-
		Subtotal	9.470	1.532		-		-		-		-	Continuing	Continuing	N/A

Remarks

For Project Management Personnel, FY18 decrease in personnel management from PB19 is due to the reduction in planned engineering effort based on successful Developmental Test in 2QFY18.

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SOM Product Development	C/CPIF	L3 : Melbourne, FL	32.579	5.078	Feb 2019	-		-		-		-	Continuing	Continuing	Continuing
CBRN IEW	C/Various	Vectrus : Reston, VA	-	6.750	Mar 2019	-		-		-		-	0.000	6.750	-
JUONS CC-0557 - Product Development	Option/ T&M	AMRDEC : Huntsville, AL	1.396	-		-		-		-		-	0.000	1.396	-
CBRN IEW	MIPR	ECBC : APG	-	2.212	Feb 2019	-		-		-		-	0.000	2.212	-
		Subtotal	33.975	14.040		-		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SOM Support Costs	MIPR	CCDC-CBD : APG, MD	-	0.319		-		-		-		-	0.000	0.319	-
		Subtotal	-	0.319		-		-		-		-	0.000	0.319	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	**Project (Number/Name)** E79 / *SMOKE/OBSCURANT SYSTEM*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SOM Test, Evaluation & OGA's	MIPR	Various OGA : Various	3.759	1.749	Nov 2018	-		-		-		-	Continuing	Continuing	Continuing
CBRN IEW	MIPR	Various OGAs : Various	-	2.212	Jan 2019	-		-		-		-	0.000	2.212	-
		Subtotal	3.759	3.961		-		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	47.204	19.852		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

FY19 budget control is incorrect. JPEO-CBRND received a total of $19.851M in PE 603627A. $12.174M for ATP IEW Requirement. $7.677M for the base program SOM

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	**Project (Number/Name)** E79 / *SMOKE/OBSCURANT SYSTEM*

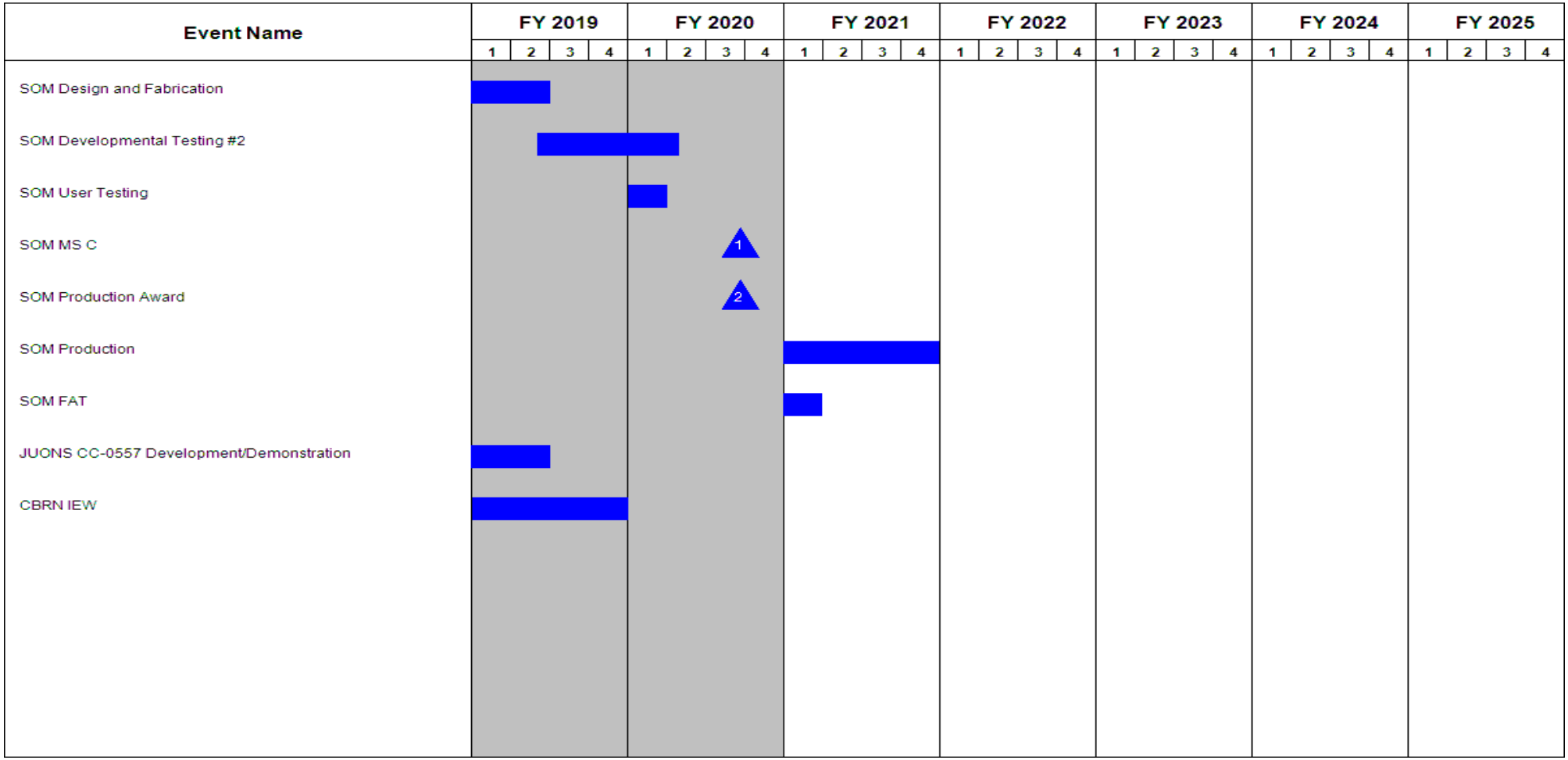

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603627A / *Smoke, Obscurant and Target Defeating Sys-Adv Dev*	**Project (Number/Name)** E79 / *SMOKE/OBSCURANT SYSTEM*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
SOM Design and Fabrication	4	2016	2	2019
SOM Developmental Testing #1	2	2018	4	2018
SOM Developmental Testing #2	2	2019	2	2020
SOM User Testing	1	2020	1	2020
SOM MS C	3	2020	3	2020
SOM Production Award	3	2020	3	2020
SOM Production	1	2021	4	2021
SOM FAT	1	2021	1	2021
JUONS CC-0557 Development/Demonstration	2	2017	2	2019
CBRN IEW	1	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	40.358	77.696	92.753	-	92.753	39.193	32.769	26.811	14.003	Continuing	Continuing
694: *Medium Caliber Ammunition*	-	1.435	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.435
BQ4: *155mm Artillery Propulsion XM654*	-	0.000	7.200	15.705	-	15.705	0.000	0.000	0.000	0.000	0.000	22.905
EB8: *OWL for Small Caliber Ammunition*	-	1.984	2.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.984
EB9: *Aviation Airborne Expendable Countermeasures*	-	5.004	3.186	4.496	-	4.496	6.054	0.000	0.000	0.000	0.000	18.740
EC2: *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*	-	5.334	6.821	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	12.155
EC3: *Ammunition Logistics Prototyping*	-	1.271	1.525	1.713	-	1.713	2.168	1.798	1.834	1.870	0.000	12.179
EL7: *Reduced Range Ammunition*	-	2.090	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.090
EU3: *.50 Caliber All-Purpose Tactical Cartridge (APTC)*	-	0.000	4.250	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.250
FA5: *Assured Precision Weapons and Munitions*	-	13.797	31.267	29.878	-	29.878	30.971	30.971	24.977	12.133	Continuing	Continuing
FG1: *Cannon-Delivered Area Effects Munitions (C-DAEM)*	-	5.713	21.447	40.961	-	40.961	0.000	0.000	0.000	0.000	Continuing	Continuing
XT5: *30mm Anti-Personnel and Counter UAS*	-	3.730	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.730

Note

In Fiscal Year (FY) 2021 there are no budget requests for:

- Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

- Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Project EP5 Adv Armor Piercing (ADVAP)
Small Caliber Ammo and Project FL4 Small Caliber Ammo Next Gen Squad Weapons.

- Project EU3 A.50 Caliber All-Purpose Tactical Cartridge (APTC) funding transitioned to BA 5 PE Budget Activity 05, PE 0604802A, Project EU5 .50 Caliber All-Purpose Tactical Cartridge (APTC).

A. Mission Description and Budget Item Justification

The Tank and Medium Caliber Ammunition Program Element encompasses a comprehensive program to develop, rapidly transition to production, and field advanced weapons and munitions for small, medium and large caliber munitions, tank ammunition, mortar ammunition, cannon artillery ammunition, and close combat system items. These Projects will ensure continued battlefield overmatch and lethality of United States maneuver forces against the full range of modern battlefield threats. To achieve this, Tank and Medium Caliber Ammunition projects will identify and develop promising technologies through competitive development and streamlined acquisition procedures.

Project 694 Medium Caliber Ammunition: This Project supports development of 30x113 millimeter (mm) self-destructing airburst munitions and qualify 30x113mm linked ammunition for ground vehicles. Increase precision and lethality capability to defeat personnel and materiel targets as well as support the Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter-Unmanned Aerial Systems (C-UAS) to counter the rapidly evolving threat of Unmanned Aerial Systems. This effort will qualify the links for use with existing M788 and M789 ammunition and develop self-destructing and airburst capable munitions fired from the Lightweight 30x113mm Link Fed Chain Gun. There is no Fiscal Year (FY) 2021 request.

Project BQ4 155mm Artillery Propulsion: Supercharge is a stand-alone top-zone 155 millimeter (mm) propelling charge required to achieve maximum range requirements from the XM1299A1 Extended Range Cannon Artillery (ERCA) Self-Propelled Howitzer (SPH). It will achieve lethality overmatch out to 70 kilometers (km) with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. Supercharge is composed of combustible cartridge case (foamed celluloid or felted fiber technology), integral metal Stub Case, electrically initiated primer, and advanced artillery propellant. FY 2021 funding will support design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) to support the concurrent development of ERCA Increment 1C and ERCA Increment 2 (with added automated loading system), which directly supports the Army's Long Range Precision Fires (LRPF) Cross Functional Team (CFT) priority in support of the National Defense Strategy.

Project EB8 OWL for Small Caliber: The OWL project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Families of Ammunition Capabilities Development Documents (CDD) and .50 caliber munitions CDD. Current small caliber ammunition tracer rounds are a pyrotechnic tracer mix which allows enemy forces to see the trace round and track its trajectory back to the shooter. The OWL project's objective is to develop and field a full tracer round to replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability, and increasing lethality by incorporating Enhanced Performance Round (EPR) technology into the new tracer ammunition. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. There is no FY 2021 funding request.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603639A *I Tank and Medium Caliber Ammunition*

Project EB9 Aviation Airborne Expendable Countermeasure (AAECM) supports the advanced development activities and technology demonstrations of the AAECM to include the XM215 Flare and XM20 Radio Frequency (RF) expendables. These expendable countermeasures systems are essential parts of survivability equipment for Army aircraft. Army Research Development Technology & Evaluation (RDT&E) efforts are coordinated with Program Executive Office (PEO) Aviation to address the AAECM capability, a critical enabler for the Future Vertical Lift (FVL) - Aircraft Survivability Equipment (ASE) CFT within the Army's top modernization priorities.

These advanced decoys will address deficiencies in Army aircraft protection and the safety of its aircrews against advanced Man-Portable Air Defense Systems (MANPADS) and shoulder launched Surface-to-Air Missiles (SAM) systems. This program will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will demonstrate component and subsystem maturity prior to integration into major Army aircraft platforms. FY 2021 includes initial developmental/operational testing on XM215 and RF Countermeasures (CM).

Project EC2 ADVAP: The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Family of Ammunition Capabilities Development Documents (CDD) and the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) which outlines the requirements for new ammunition to support the rapid prototyping/development of the Next Generation Squad Weapons (NGSW) under the Middle Tier of Acquisition (MTA) authority for rapid prototyping/rapid fielding. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges.

The Next Generation Squad Weapons (NGSW) ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). The nomenclature for the GP ammunition is XM1186 and the nomenclature for the SP ammunition is XM1184. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) ammunition to defeat hard targets. There is no FY 2021 funding request.

Project EC3 Ammunition Logistics Prototyping: This Project supports the future force by improving the distribution, management, reliability and survivability of ammunition through the advanced development, integration, and demonstration of logistics system enablers. These enablers will improve the efficiency and effectiveness of ammunition operations, to include retrograde, while reducing the logistics footprint on the battlefield. Technology areas addressed include handling, distribution, and management (strategic and tactical), prognostics, diagnostics, and asset visibility, explosives safety, and adaptive and environmentally friendly packaging and palletization. The efficient deployment and sustainment of reliable ammunition is vital to success on the battlefield. This Project enhances the operational effectiveness of the ammunition logistics system to ensure the distribution of reliable ammunition to the warfighter. FY 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices, as well as, verifying that issues found during testing have been resolved. FY 2021 funding will also be used to demonstrate a suite of monitoring technologies, which will be used for assessing munitions reliability.

Project EL7 Reduced Range Ammunition: The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62 millimeter (mm) and .50 caliber Capabilities Development Documents (CDD). The overall objective of RRA is to provide training ammunition suitable for use on military installations with Surface Danger Zone (SDZ) restrictions. The relatively long maximum range of the 7.62mm and .50 caliber service ammunition poses challenges on training ranges in range restricted areas. RRA will mitigate a training gap on installations by providing a materiel solution that meets training needs while shortening and condensing the SDZ. This will allow soldiers to train with 7.62mm and .50 caliber weapons on restricted ranges. The RRA cartridge design will be compatible with all Army 7.62mm and .50 caliber weapons but specifically optimized to work in the M240 and M2 Machine Guns. There is no funding requested in FY 2021.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603639A *I Tank and Medium Caliber Ammunition*

Project EU3 .50 Caliber APTC: The APTC project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of APTC is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The APTC will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. There is no FY 2021 funding request.

Project FA5 APWM: The APWM is focused on advanced risk mitigation, technology integration, prototyping, and product support to identify, evaluate, mature, test, and demonstrate various assured precision prototype technologies in weapon and munitions components and subsystems within a complex system of systems environment. The APWM Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping, which increases lethality and ensures future combat overmatch success of the Joint Force against peer/near-peer adversaries. This project also aims to improve program performance and affordability for multiple weapons and munitions Programs of Record (PoRs) via Joint Lethality Positioning, Navigation and Timing (PNT) and Army M-Code Global Positioning System (GPS) coordinated efforts. The APWM Project directly supports top Army Modernization Priorities via the Assured-PNT (A-PNT) and LRPF CFT imperatives in support of the National Defense Strategy. FY 2021 funding will support engagement by Weapons and Munitions PNT experts in the development, evaluation, and technology delivery activities of the Air Force's M-Code GPS, Army's PNT related programs, and A-PNT CFT programs in support of LRPF and Counter Area Access/Area Denial missions. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a NavWar system-of-systems environment, Army M-Code GPS technology integration and evaluation, planning for next generation M-Code GPS integration into the Long Range-Precision Guidance Kit (LR-PGK) as the DoD-selected representative Joint precision munition, and maturation of alternative PNT related technologies and solutions to enable informed A-PNT related PoR milestone and Army cross-functional modernization decisions.

Project FG1 C-DAEM: The Cannon-Delivered Area Effects Munitions (C-DAEM) Project will provide United States (U.S). ground forces with the capability to engage area personnel through armored targets, while denying threat forces full operational freedom within the targeted area. An Analysis of Alternatives (AoA) was completed in January 2018 to inform Army acquisition and investment decisions regarding replacement of the current stockpile of 155 millimeter (mm) Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense (DoD) policy compliant munitions and address anti-armor and extended range capability requirements. The Army validated two materiel solutions for C-DAEM to be pursued in parallel. C-DAEM Armor (Increment 1) will destroy moved and moving infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM DPICM Replacement (Increment 2) will destroy personnel to light-skinned vehicles. FY 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase, which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy.

Project XT5 30mm Anti-Personnel and Counter UAS: Lightweight 30x113mm (LW30) Airburst is a new capability identified as a Warfighter requirement in the Capability Production Document (CPD), AH-64E Helicopter, Increment 1, Version 6. The LW30 airburst cartridge improves the ability of the Warfighter to effectively engage antipersonnel/materiel targets due to increased lethality. Airburst capability provides the user with a much higher probability of achieving a first burst kill against enemy personnel targets in the open. The LW30 will retain its dual purpose warhead, allowing it to continue to defeat light armored threats through point detonation. The cartridge provides increased lethal effects against personnel and soft-skin vehicular targets increasing Soldier Survivability on the ground during troops in contact engagements and decreases the required number of rounds to reach the desired lethal effects. There is no funding requested in FY 2021.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*		R-1 Program Element (Number/Name) PE 0603639A *I Tank and Medium Caliber Ammunition*			
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	41.921	82.146	50.948	-	50.948
Current President's Budget	40.358	77.696	92.753	-	92.753
Total Adjustments	-1.563	-4.450	41.805	-	41.805
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-4.450			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.563	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	41.805	-	41.805

Change Summary Explanation

Increase due to continuation and completion of the Cannon-Delivered Area Effects Munitions (C-DAEM) - Armor (Increment 1) competitive demonstration activities resourced in Project FG1. Increase also attributed to risk reduction and prototype maturation efforts for two parallel Supercharge variants to support concurrent development of Extended Range Cannon Artillery (ERCA) Increment 1C and ERCA Increment 2 (with automated loading system) resourced in Project BQ4.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) 694 / *Medium Caliber Ammunition*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
694: *Medium Caliber Ammunition*	-	1.435	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.435
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 694 Medium Caliber Ammunition supports development of 30x113 millimeter (mm) self-destructing airburst munitions and qualify 30x113mm linked ammunition for ground vehicles. Increase precision and lethality capability to defeat personnel and materiel targets as well as support the Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter-Unmanned Aerial Systems (C-UAS) to counter the rapidly evolving threat of Unmanned Aerial Systems. This effort will qualify the links and XM950 TP ammunition and develop self-destructing and airburst capable munitions fired from the Lightweight 30x113mm Link Fed Chain Gun. There is no Fiscal Year (FY) 2021 funding request.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Linked 30x113mm Ammunition Qualification and Airburst Development	1.435	-	-
Description: Qualify linked 30x113mm Percussion Primed XM950 Ammunition and develop self-destructing and airburst capable munitions.			
Accomplishments/Planned Programs Subtotals	1.435	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• E09900: *CTG, 30mm HEDP, M789, Single, f/Gun M230*	5.105	5.221	5.323	-	5.323	5.354	5.357	5.357	5.001	0.000	36.718
• E10100: *CTG, 30mm TP, M788, Single, f/Gun M230*	36.133	22.868	23.341	-	23.341	27.783	37.278	37.417	36.837	0.000	221.657

Remarks

D. Acquisition Strategy

30x113mm - An other transaction agreement (OTA) contract was awarded to purchase links for the 30x113mm ammunition. Linked ammunition deliveries will be synchronized with test schedules for ammunition/weapon qualification and Remote Weapon Station (RWS)/vehicle system integration. Ammunition qualification tests and weapon qualification tests will be conducted in FY 2020. Purchase of linked 30x113mm cartridges will transition to competitive procurement by FY 2020. Efforts to develop a self-destructing airburst capable munition and a guided 30x113mm munition will also be conducted.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) 694 / *Medium Caliber Ammunition*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
30x113mm Self Destruct and Airburst Ammo Development Contract	C/CPFF	Northrop Grumman Innovation Systems (NGIS) : Plymouth, MN	7.771	0.435	Dec 2019	-		-		-		-	0.000	8.206	-
		Subtotal	7.771	0.435		-		-		-		-	0.000	8.206	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
30x113mm Ammo Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny, NJ	-	0.500	Nov 2018	-		-		-		-	0.000	0.500	-
		Subtotal	-	0.500		-		-		-		-	0.000	0.500	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
30x113mm Self Destruct Safety Test	MIPR	Aberdeen Testing Center (ATC) : Aberdeen, MD	-	0.300	Dec 2019	-		-		-		-	0.000	0.300	-
30x113mm Electromagnetic Environment Effects Test	MIPR	Redstone Arsenal : Redstone, Al	-	0.200	Dec 2019	-		-		-		-	0.000	0.200	-
		Subtotal	-	0.500		-		-		-		-	0.000	0.500	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) 694 / *Medium Caliber Ammunition*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	7.771	1.435		0.000		-		-		-	0.000	9.206	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** 694 / *Medium Caliber Ammunition*

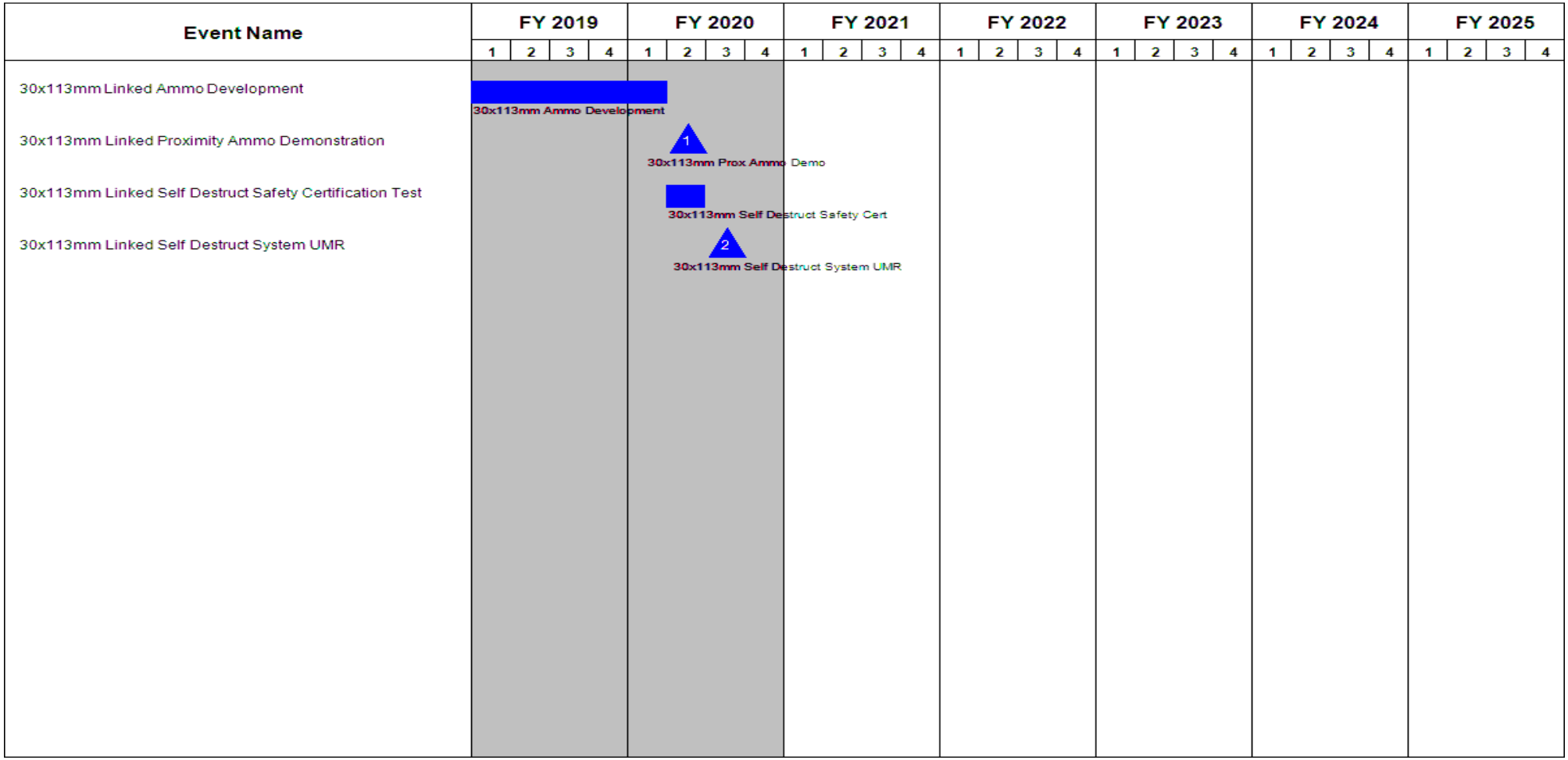

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** 694 / *Medium Caliber Ammunition*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
30x113mm Events	2	2016	2	2017
30x113mm Ammo Development Contract Award	4	2018	4	2018
30x113mm Linked Ammo Development	4	2018	1	2020
30x113mm Linked Proximity Ammo Demonstration	2	2020	2	2020
30x113mm Linked Self Destruct Safety Certification Test	2	2020	2	2020
30x113mm Linked Self Destruct System UMR	3	2020	3	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) BQ4 / *155mm Artillery Propulsion XM654*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BQ4: *155mm Artillery Propulsion XM654*	-	0.000	7.200	15.705	-	15.705	0.000	0.000	0.000	0.000	0.000	22.905
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Supercharge is a stand-alone top-zone 155 millimeter (mm) propelling charge required to achieve maximum range requirements from the XM1299A1 Extended Range Cannon Artillery (ERCA) Self-Propelled Howitzer (SPH). It will achieve lethality overmatch out to 70 kilometers (km) with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. Supercharge is composed of combustible cartridge case (foamed celluloid or felted fiber technology), integral metal Stub Case, electrically initiated primer, and advanced artillery propellant. Fiscal Year (FY) 2021 funding will support design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) to support the concurrent development of ERCA Increment 1C and ERCA Increment 2 (with added automated loading system), which directly supports the Army's Long Range Precision Fires Cross Functional Team priority in support of the National Defense Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: 155mm Artillery Propulsion Supercharge	-	6.873	15.705
Description: Unitary top-zone propelling charge for XM907E2 Extended Range Cannon with Slide-block breech for use with ERCA Increments 1C and 2 to gain range overmatch for 155mm artillery. ***FY 2020 Plans:*** Performed charge establishment and charge uniformity in preparation for ballistic testing including preliminary blast overpressure and charge verification across operational temperatures. Performed packaging rough handling testing. ***FY 2021 Plans:*** FY 2021 funds will continue the support of concurrent design risk reduction and prototype maturation efforts for two Supercharge variants (2-piece bag and cased) to support the acceleration of ERCA Increment 1C and ERCA Increment 2 with automated loading system. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 increase to support maturation of two Supercharge variants to support Army modernization requirements to achieve lethality at 70km with precision accuracy by FY 2023.			
Title: FY 2020 SBIR/STTR Transfer	-	0.327	-
Description: Funding transferred in accordance with Title 15 USC ?638			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** BQ4 / *155mm Artillery Propulsion XM654*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	7.200	15.705

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 232: *Advanced Lethality & Survivability Demo*	70.696	-	0.000	-	0.000	-	-	-	-	0.000	70.696
• BQ3: *155mm Artillery Propulsion XM654*	-	-	0.000	-	0.000	34.887	25.883	14.815	-	0.000	75.585

Remarks

In FY 2022, this Project will transition to Budget Activity 05, Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Project BQ3 155mm Artillery Propulsion XM654. A Procurement of Ammunition, Army (PAA) funding line, Standard Study Number E99350, was established for transition to procurement FY 2022.

D. Acquisition Strategy

The Supercharge Project will consist of critical technology prototyping, testing, and demonstration of two variants: (1) the Urgent Materiel Release (UMR) of Supercharge 2-piece Bag to support the acceleration of the Extended Range Cannon Artillery (ERCA) Increment 1C to achieve lethality at 70km with precision accuracy by FY 2023, and (2) the Full Materiel Release (FMR) of Supercharge Cased to support ERCA Increment 2 with added automated loading system. The Project will utilize the Defense Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) for the integration of components such as propellant, combustible case, igniter and stub case. Upon design maturation, the Supercharge 2-piece Bag will transition and conduct Engineering Manufacturing and Development (EMD) tasks to qualify the design for UMR to support the ERCA Increment 1C First Unit Issues (FUI). The Supercharge Cased will require additional developmental testing and qualification for Low Rate Initial Production (LRIP) to support ERCA Increment 2. Federal Acquisition Regulation (FAR) based production contract(s) will be awarded after the Supercharge Cased Milestone C for LRIP and Full Rate Production (FRP).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) BQ4 / *155mm Artillery Propulsion XM654*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	-		0.185	Jan 2020	0.500	Oct 2020	-		0.500	0.000	0.685	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.327		-		-		-	0.000	0.327	-
		Subtotal	-	-		0.512		0.500		-		0.500	0.000	1.012	N/A

Remarks

Program Management reflects Supercharge travel and milestone documentation support. Fiscal Year (FY) 2021 increase required to support the significant increase in test activities.

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Supercharge Prototype Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		2.625	Mar 2020	7.705	Nov 2020	-		7.705	0.000	10.330	-
Developmental Projectile/ Fuze Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		0.965	Mar 2020	1.100	Nov 2020	-		1.100	0.000	2.065	-
		Subtotal	-	-		3.590		8.805		-		8.805	0.000	12.395	N/A

Remarks

FY 2021 increase to support prototype maturation of two Supercharge variants to support Army modernization requirements to achieve lethality at 70 kilometers (km) with precision accuracy by FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** BQ4 / *155mm Artillery Propulsion XM654*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny Arsenal, NJ	-	-		1.684	Jan 2020	2.125	Oct 2020	-		2.125	0.000	3.809	-
		Subtotal	-	-		1.684		2.125		-		2.125	0.000	3.809	N/A

Remarks

Engineering support required for ongoing design risk reduction and prototype maturation efforts of two Supercharge variants.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Supercharge Prototype Testing	MIPR	Army Test & Evaluation Command (ATEC) : Yuma, AZ	-	-		1.414	Apr 2020	4.275	Jan 2021	-		4.275	0.000	5.689	-
		Subtotal	-	-		1.414		4.275		-		4.275	0.000	5.689	N/A

Remarks

Additional FY 2021 testing activities required for ongoing design risk reduction and prototype maturation efforts of two Supercharge variants.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		7.200		15.705		-		15.705	0.000	22.905	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** BQ4 / *155mm Artillery Propulsion XM654*

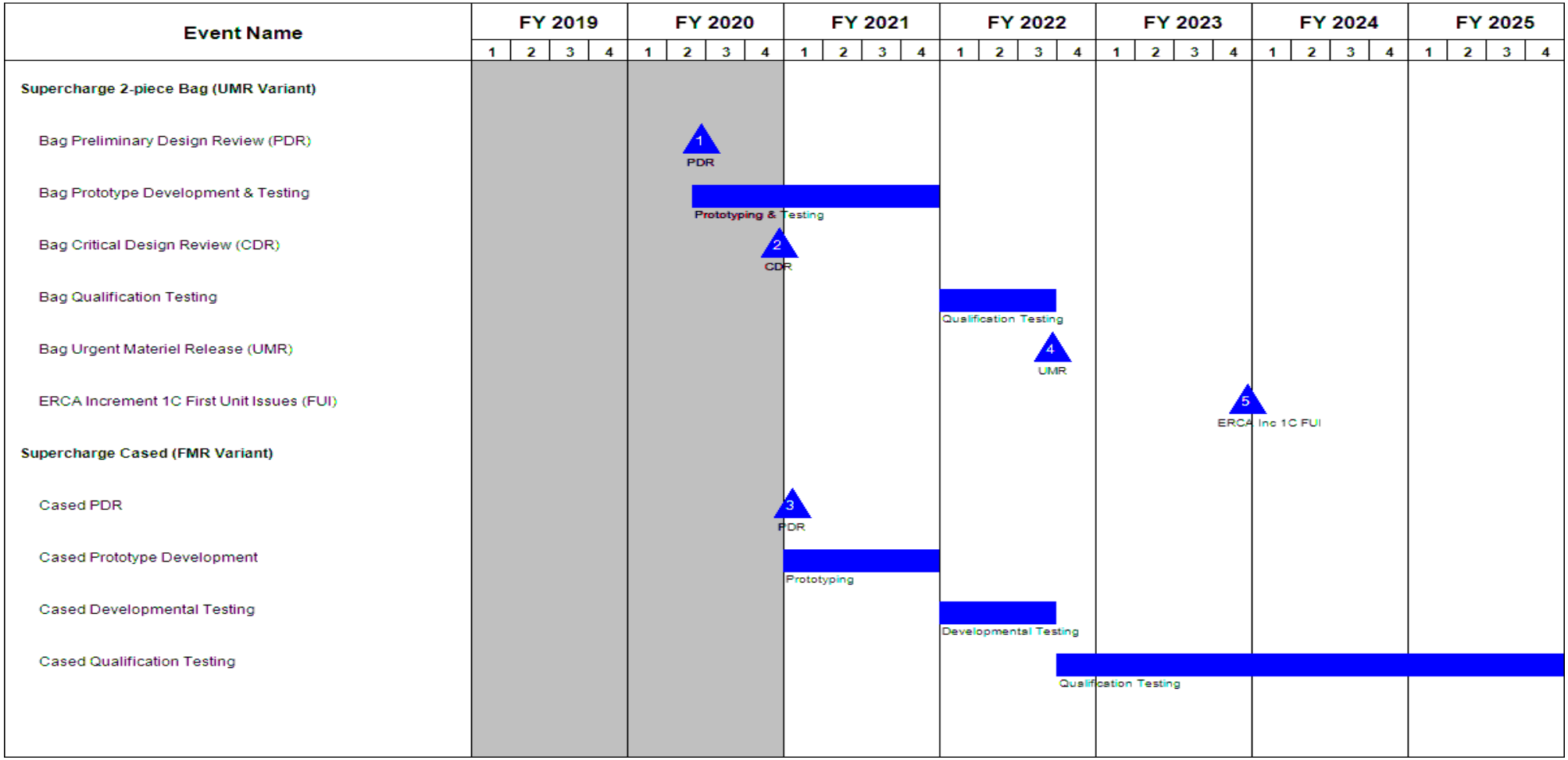

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** BQ4 / *155mm Artillery Propulsion XM654*

Note

Schedule reflects design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) required to support the concurrent development of the Extended Range Cannon Artillery (ERCA) Increment 1C (accelerated to achieve precision accuracy at 70km range by FY 2023) and ERCA Increment 2 (with added automated loading system).

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** BQ4 / *155mm Artillery Propulsion XM654*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Supercharge 2-piece Bag (UMR Variant)	1	2020	3	2022
Bag Preliminary Design Review (PDR)	2	2020	2	2020
Bag Prototype Development & Testing	2	2020	4	2021
Bag Critical Design Review (CDR)	4	2020	4	2020
Bag Qualification Testing	1	2022	3	2022
Bag Urgent Materiel Release (UMR)	3	2022	3	2022
ERCA Increment 1C First Unit Issues (FUI)	4	2023	4	2023
Supercharge Cased (FMR Variant)	1	2020	4	2025
Cased PDR	1	2021	1	2021
Cased Prototype Development	1	2021	4	2021
Cased Developmental Testing	1	2022	3	2022
Cased Qualification Testing	4	2022	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB8 / *OWL for Small Caliber Ammunition*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EB8: *OWL for Small Caliber Ammunition*	-	1.984	2.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.984
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

A. Mission Description and Budget Item Justification

The OWL project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Families of Ammunition Capabilities Development Documents (CDD) and .50 caliber munitions CDD. Current small caliber ammunition tracer rounds are a pyrotechnic tracer mix which allows enemy forces to see the trace round and track its trajectory back to the shooter. The OWL project's objective is to develop and field a full tracer round to replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability, and increasing lethality by incorporating Enhanced Performance Round (EPR) technology into the new tracer ammunition. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. There is no Fiscal Year (FY) 2021 funding request.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR) ***Description:*** OWL will develop and demonstrate a full tracer technology that eliminates the shortcomings of current legacy tracers. ***FY 2020 Plans:*** FY 2020 efforts continued activities to mature 5.56mm Technology Readiness Level (TRL). Plans included testing 5.56mm prototype solutions in preparation for TRL 6. Evaluate .50 Caliber and Next Generation Weapon Systems (NGSW) small caliber ammunition OWL technology/prototype ammunition and mature TRLs. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Project EB8 OWL for Small Caliber funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.	1.984	1.909	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	0.091	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	1.984	2.000	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP4: *One-Way Luminescence for Small Caliber Ammo*	5.855	8.547	13.977	-	13.977	6.981	7.393	2.998	-	0.000	45.751

Remarks

Project EB8 OWL for Small Caliber funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

D. Acquisition Strategy

The OWL technology will be integrated into the M80A1 trace ammunition production. The OWL concept will be developed through Government and Industry prototyping efforts. Technology Readiness Assessments (TRAs) were conducted in FY 2017 and FY 2018 to evaluate the Industry and Government concepts in order to proceed with the 7.62mm Engineering and Manufacturing Development (EMD) in FY 2019. The 5.56mm and .50 caliber cartridges will follow the 7.62mm schedule with EMD scheduled to commence in FY 2021 for the 5.56mm variant. The new 5.56mm tracer cartridges will replace the legacy 5.56mm M856A1 tracer.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB8 / *OWL for Small Caliber Ammunition*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.091		-		-		-	0.000	0.091	-
		Subtotal	-	-		0.091		-		-		-	0.000	0.091	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Tooling Development	Option/ CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	0.780	Feb 2019	0.238	Feb 2020	-		-		-	0.000	1.018	Continuing
Prototype Development Contract 1	Option/ CPFF	General Dynamics : Florham Park, NJ	0.515	-		0.388	Feb 2020	-		-		-	0.000	0.903	Continuing
Prototype Development Contract 2	Option/ CPFF	Nammo Tally : Mesa, AZ	0.515	-		0.388	Feb 2020	-		-		-	0.000	0.903	Continuing
		Subtotal	1.030	0.780		1.014		-		-		-	0.000	2.824	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny, NJ	5.472	1.136	Oct 2018	0.564	Oct 2019	-		-		-	2.498	9.670	Continuing
Development Support	Option/ FFP	Leidos Inc. : Reston, VA	-	0.068	Feb 2019	-		-		-		-	0.000	0.068	-
		Subtotal	5.472	1.204		0.564		-		-		-	2.498	9.738	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB8 / *OWL for Small Caliber Ammunition*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Research Lab (ARL)	MIPR	Army Research Lab (ARL) : Aberdeen, MD	0.278	-		0.029	Oct 2019	-		-		-	1.500	1.807	Continuing
Army Corps of Engineers	MIPR	Army Corps of Engineers : Vicksburg, MO	0.388	-		0.024	Oct 2019	-		-		-	1.500	1.912	Continuing
Army Joint Munitions Command	MIPR	Army Joint Munitions Command : Rock Island, IL	0.204	-		0.039	Oct 2019	-		-		-	0.000	0.243	-
Prototype testing	Option/ FFP	Double B Enterprises : Malvern, IA	0.200	-		0.239	Feb 2020	-		-		-	0.000	0.439	Continuing
		Subtotal	1.070	-		0.331		-		-		-	3.000	4.401	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	7.572	1.984		2.000		-		-		-	5.498	17.054	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

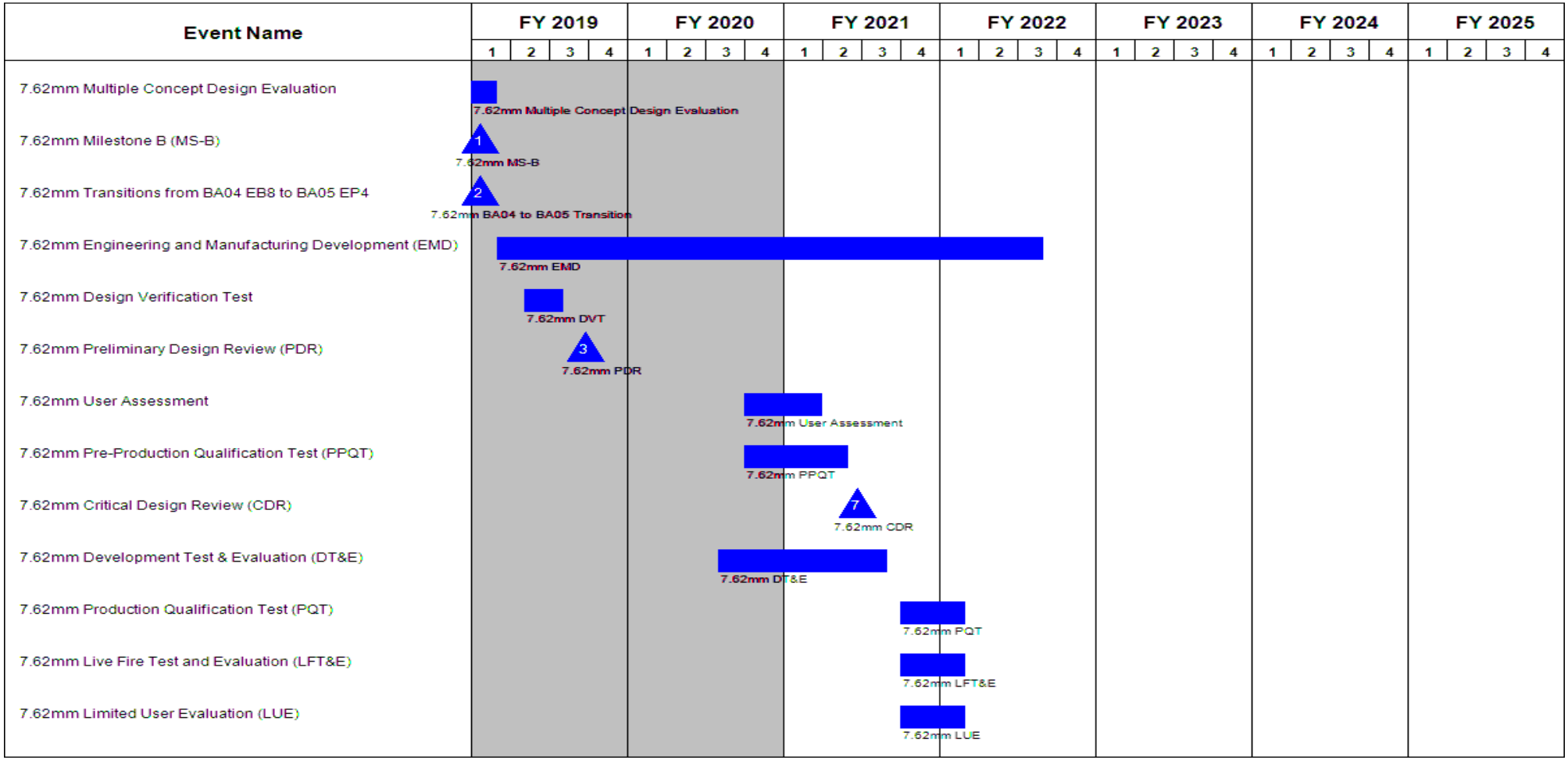

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

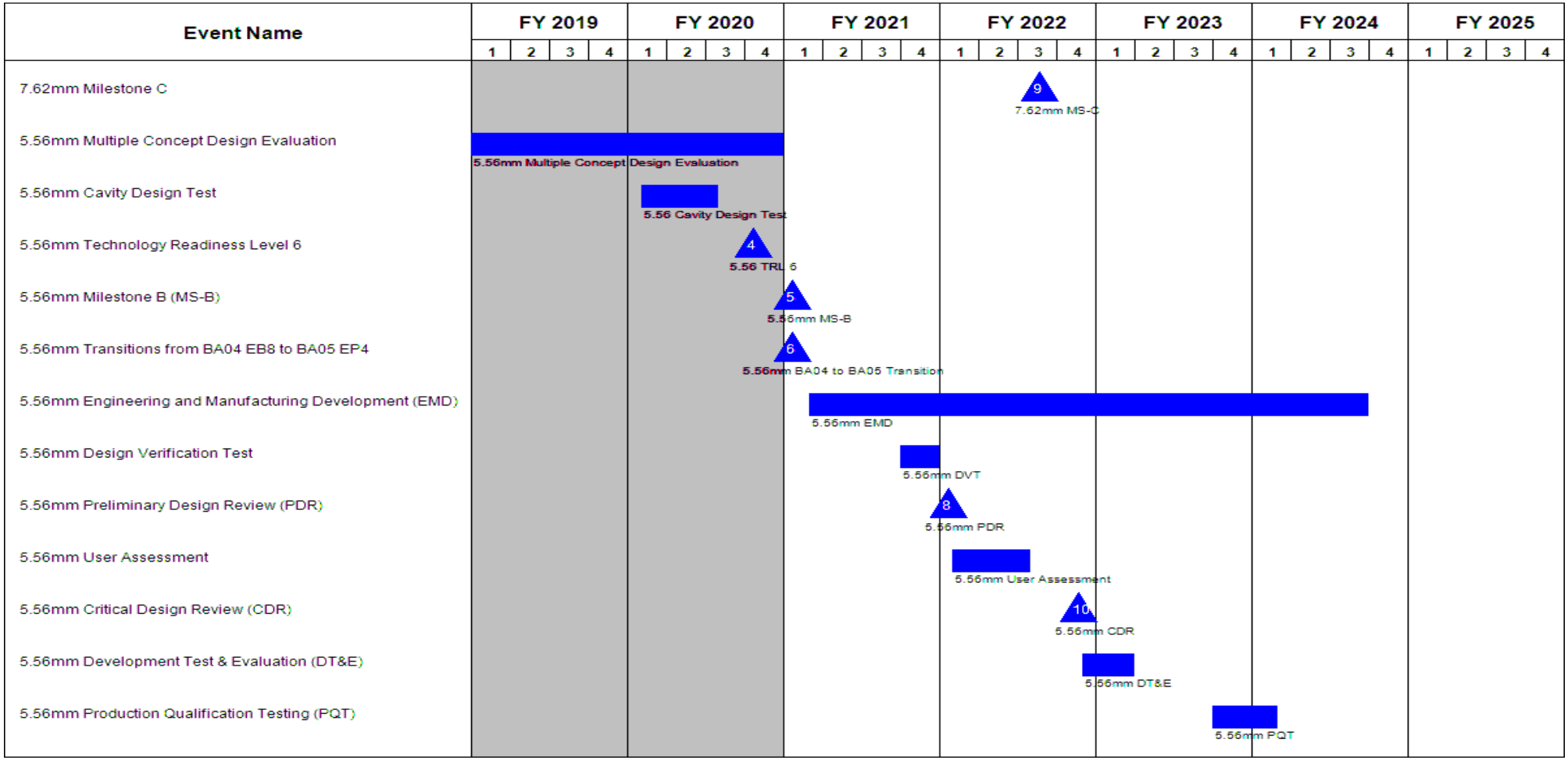

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

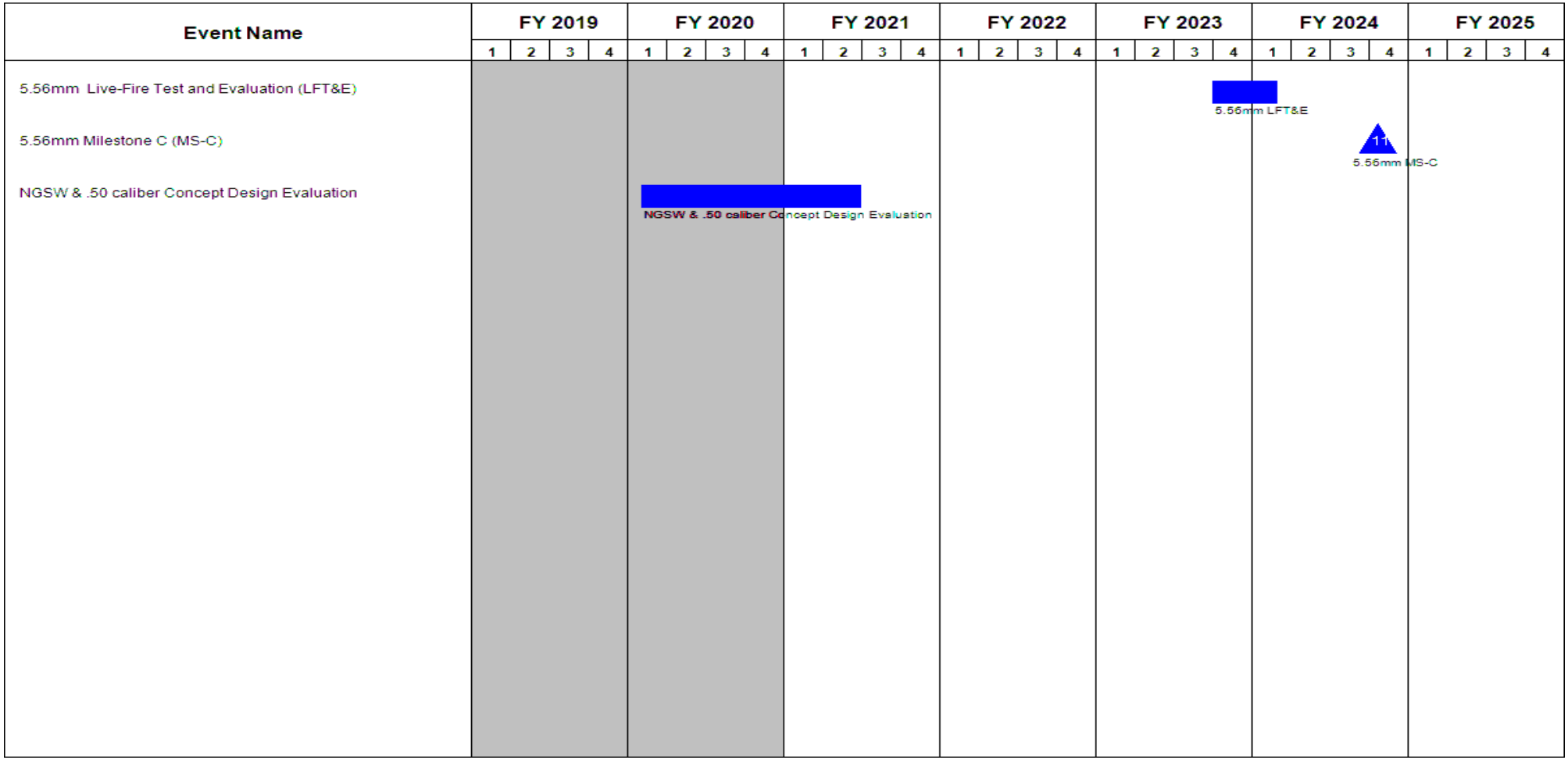

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
7.62mm Materiel Development Decision (MDD)	4	2016	4	2016
7.62mm Multiple Concept Design Evaluation	1	2015	1	2019
7.62mm Milestone B (MS-B)	1	2019	1	2019
7.62mm Transitions from BA04 EB8 to BA05 EP4	1	2019	1	2019
7.62mm Engineering and Manufacturing Development (EMD)	1	2019	3	2022
7.62mm Design Verification Test	2	2019	3	2019
7.62mm Preliminary Design Review (PDR)	3	2019	3	2019
7.62mm User Assessment	4	2020	1	2021
7.62mm Pre-Production Qualification Test (PPQT)	4	2020	2	2021
7.62mm Critical Design Review (CDR)	2	2021	2	2021
7.62mm Development Test & Evaluation (DT&E)	3	2020	3	2021
7.62mm Production Qualification Test (PQT)	4	2021	1	2022
7.62mm Live Fire Test and Evaluation (LFT&E)	4	2021	1	2022
7.62mm Limited User Evaluation (LUE)	4	2021	1	2022
7.62mm Milestone C	3	2022	3	2022
5.56mm Materiel Development Decision (MDD)	3	2018	3	2018
5.56mm Project Starts on BA04 EB8	3	2018	3	2018
5.56mm Multiple Concept Design Evaluation	4	2018	4	2020
5.56mm Cavity Design Test	1	2020	3	2020
5.56mm Technology Readiness Level 6	4	2020	4	2020
5.56mm Milestone B (MS-B)	1	2021	1	2021
5.56mm Transitions from BA04 EB8 to BA05 EP4	1	2021	1	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB8 / *OWL for Small Caliber Ammunition*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
5.56mm Engineering and Manufacturing Development (EMD)	1	2021	3	2024
5.56mm Design Verification Test	4	2021	4	2021
5.56mm Preliminary Design Review (PDR)	1	2022	1	2022
5.56mm User Assessment	1	2022	3	2022
5.56mm Critical Design Review (CDR)	4	2022	4	2022
5.56mm Development Test & Evaluation (DT&E)	4	2022	1	2023
5.56mm Production Qualification Testing (PQT)	4	2023	1	2024
5.56mm Live-Fire Test and Evaluation (LFT&E)	4	2023	1	2024
5.56mm Milestone C (MS-C)	4	2024	4	2024
NGSW & .50 caliber Concept Design Evaluation	1	2020	2	2021

Note

As the technology matures, Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB9 / *Aviation Airborne Expendable Countermeasures*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EB9: *Aviation Airborne Expendable Countermeasures*	-	5.004	3.186	4.496	-	4.496	6.054	0.000	0.000	0.000	0.000	18.740
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EB9 / Aviation Airborne Expendable Countermeasures within PE 0603639A / Tank and Medium Caliber Ammunitions transitions to Engineering and Manufacturing Development (EMD) under Project EP7 / Aviation Airborne Expendable Countermeasures within PE 0604802A / Weapons and Munitions - Eng Dev.

A. Mission Description and Budget Item Justification

Project EB9 Aviation Airborne Expendable Countermeasure (AAECM) supports the advanced development activities and technology demonstrations of the AAECM to include the XM215 Flare and XM20 Radio Frequency (RF) expendables. These expendable countermeasures systems are essential parts of survivability equipment for Army aircraft. Army Research Development Technology & Evaluation (RDT&E) efforts are coordinated with Program Executive Office (PEO) Aviation to address the AAECM capability, a critical enabler for the Future Vertical Lift (FVL) - Aircraft Survivability Equipment (ASE) Cross Functional Team (CFT) within the Army's top modernization priorities.

These advanced decoys will address deficiencies in Army aircraft protection and the safety of its aircrews against advanced Man-Portable Air Defense Systems (MANPADS) and shoulder launched Surface-to-Air Missiles (SAM) systems. This program will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will demonstrate component and subsystem maturity prior to integration into major Army aircraft platforms. FY 2021 supports initial developmental/operational testing on XM215 and RF Countermeasures (CM).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Expendable Countermeasures to Guided Missile Threats	5.004	3.041	4.496
Description: This program will develop expendable CM decoys which will protect Army aircraft from surface-to-air missiles.			
FY 2020 Plans: Conducted optimization for the XM215 during Technology Maturation & Risk Reduction (TMRR), System Requirements Review (SRR) and flight testing. Continued maturing prototype design and technology and Pre-Engineering and Manufacturing Development (EMD) review. Prepared Initial documentation to support Milestone B for Radio Frequency (RF) Countermeasures (CM). Conducted Pre-EMD review and Preliminary Design Review (PDR) for RF CM.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB9 / *Aviation Airborne Expendable Countermeasures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Transition from Technology Maturation & Risk Reduction (TMRR) to EMD Phase of program and complete flight testing and Modeling and Simulation efforts. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase from FY 2020 to FY 2021 due to additional testing and modeling and simulation requirements.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.145	-
Accomplishments/Planned Programs Subtotals	5.004	3.186	4.496

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP7: *Aviation Airborne Expendable Countermeasures*	-	4.920	4.476	-	4.476	8.241	-	-	-	0.000	17.637

Remarks

D. Acquisition Strategy

A Technical Development Strategy (TDS) for the development and production of Flare, Aircraft: Countermeasure XM215 and RF Decoys under the AAECM program for the United States (U.S.) Army will be used. Prototyping contracts will be awarded competitively under the Department of Defense (DoD) Ordnance Technology Consortium (DOTC) Section 845 Other Transaction Authority (OTA) contract mechanism. Following Milestone B EMD activities will include continued design development, flight testing, design verification review, and developmental and operational testing ahead of Milestone C.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB9 / *Aviation Airborne Expendable Countermeasures*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.145		-		-		-	0.000	0.145	-
		Subtotal	-	-		0.145		-		-		-	0.000	0.145	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
XM215 Development	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	2.638	0.894	Nov 2018	-		-		-		-	0.000	3.532	-
RF Development	C/FFP	CCDC Armaments Center : Picatinny Arsenal, NJ	0.773	0.787	Jun 2019	1.401	Jan 2020	-		-		-	0.000	2.961	-
		Subtotal	3.411	1.681		1.401		-		-		-	0.000	6.493	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RF Engineering Support	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	0.650	-		0.588	Jan 2020	0.500	Oct 2020	-		0.500	0.000	1.738	-
		Subtotal	0.650	-		0.588		0.500		-		0.500	0.000	1.738	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
XM215 Flight Test and Evaluation	MIPR	Various : Various	2.732	1.468	Apr 2019	-		-		-		-	0.000	4.200	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EB9 / *Aviation Airborne Expendable Countermeasures*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RF Flight Test and Evaluation	MIPR	Various : Various	0.705	1.855	Jul 2019	1.052	May 2020	-		-		-	0.000	3.612	-
RF Modeling & Simulation	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	1.072	-		-		0.500	Dec 2020	-		0.500	0.000	1.572	-
RF Design Verification and Flight Testing	TBD	TBD : TBD	-	-		-		3.496	Dec 2020	-		3.496	0.000	3.496	-
		Subtotal	4.509	3.323		1.052		3.996		-		3.996	0.000	12.880	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	8.570	5.004		3.186		4.496		-		4.496	0.000	21.256	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB9 / *Aviation Airborne Expendable Countermeasures*

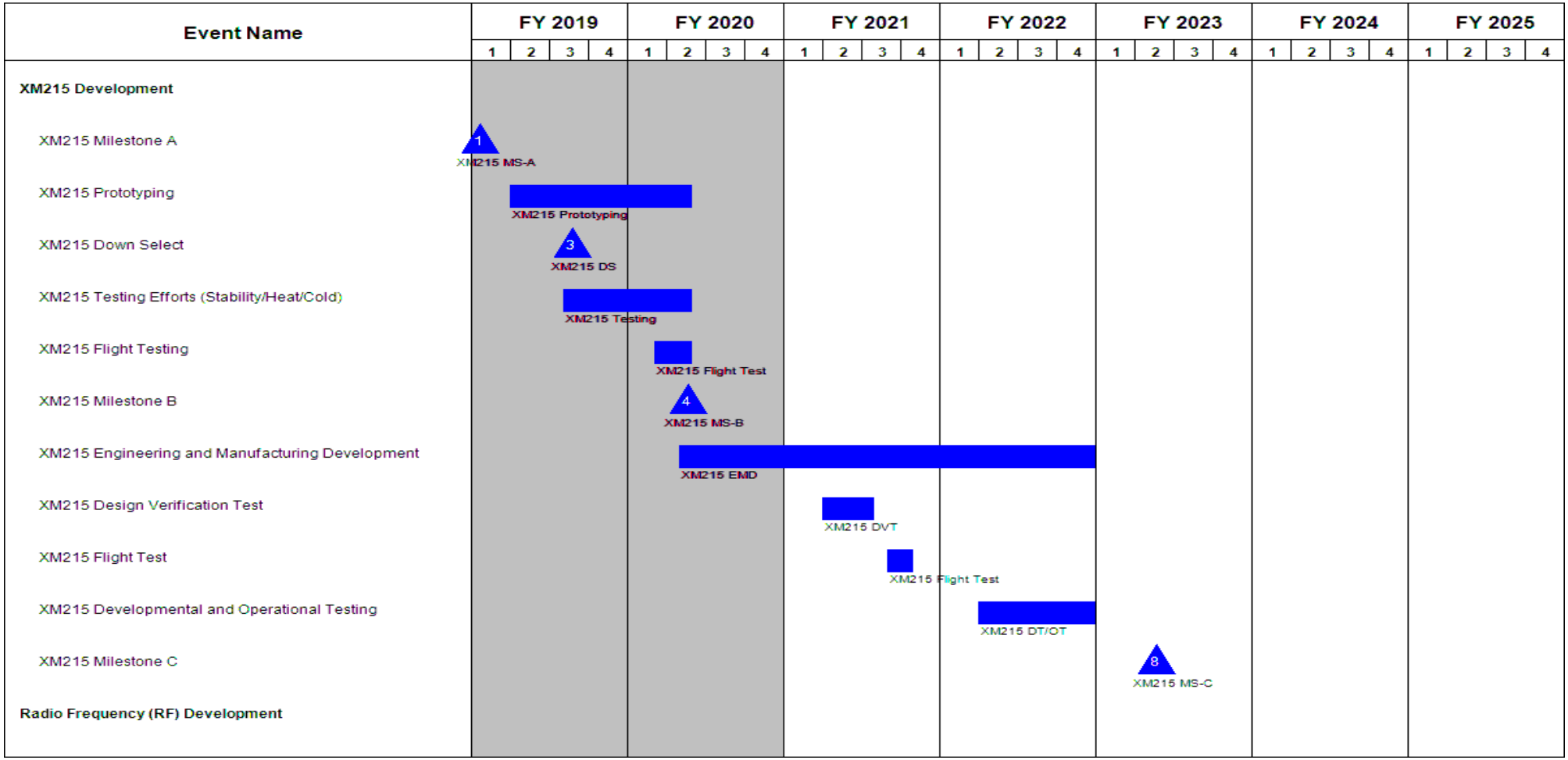

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB9 / *Aviation Airborne Expendable Countermeasures*

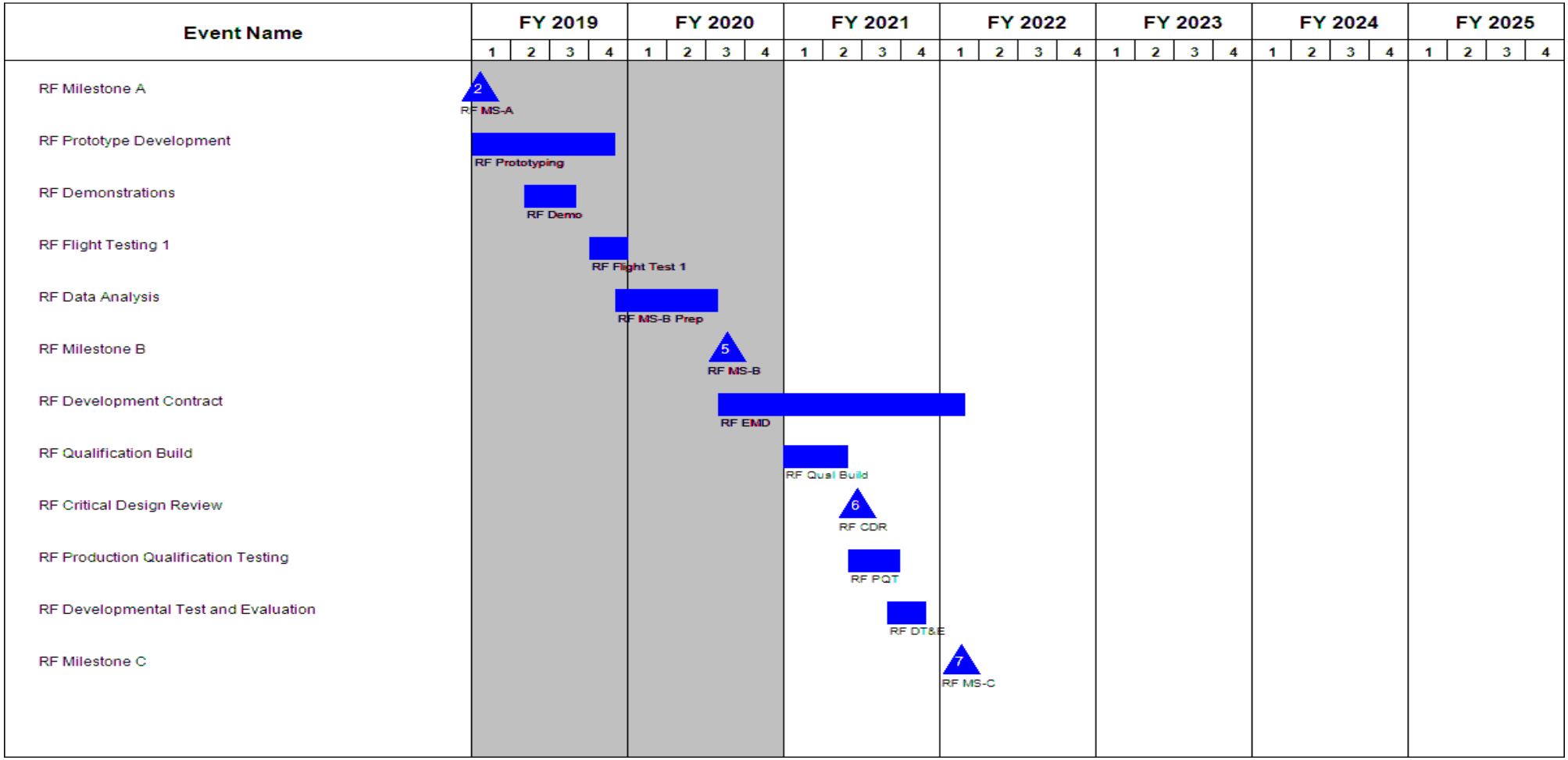

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB9 / *Aviation Airborne Expendable Countermeasures*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
XM215 Development	1	2019	4	2025
XM215 Milestone A	1	2019	1	2019
XM215 Prototyping	1	2019	2	2020
XM215 Down Select	3	2019	3	2019
XM215 Testing Efforts (Stability/Heat/Cold)	3	2019	2	2020
XM215 Flight Testing	1	2020	2	2020
XM215 Milestone B	2	2020	2	2020
XM215 Engineering and Manufacturing Development	2	2020	4	2022
XM215 Design Verification Test	2	2021	3	2021
XM215 Flight Test	3	2021	4	2021
XM215 Developmental and Operational Testing	2	2022	4	2022
XM215 Milestone C	2	2023	2	2023
Radio Frequency (RF) Development	1	2019	4	2025
RF Milestone A	1	2019	1	2019
RF Prototype Development	1	2019	4	2019
RF Demonstrations	2	2019	3	2019
RF Flight Testing 1	4	2019	4	2019
RF Data Analysis	4	2019	3	2020
RF Milestone B	3	2020	3	2020
RF Development Contract	3	2020	1	2022
RF Qualification Build	1	2021	2	2021
RF Critical Design Review	2	2021	2	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EB9 / *Aviation Airborne Expendable Countermeasures*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
RF Production Qualification Testing	2	2021	3	2021
RF Developmental Test and Evaluation	3	2021	4	2021
RF Milestone C	1	2022	1	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EC2: *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*	-	5.334	6.821	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	12.155
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020 Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Project FL4 Small Caliber Ammo Next Gen Squad Weapons.

A. Mission Description and Budget Item Justification

The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Family of Ammunition Capabilities Development Documents (CDD) and the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) which outlines the requirements for new ammunition to support the rapid prototyping/development of the Next Generation Squad Weapons (NGSW) under the Middle Tier of Acquisition (MTA) authority for rapid prototyping/rapid fielding. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges.

The Next Generation Squad Weapons (NGSW) ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). The nomenclature for the GP ammunition is XM1186 and the nomenclature for the SP ammunition is XM1184. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) ammunition to defeat hard targets.

There is no Fiscal Year (FY) 2021 funding request.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Small Caliber Ammunition Rapid Prototyping	5.334	6.821	-
Description: Develop, demonstrate, and qualify small caliber ADVAP cartridges that can defeat threat targets and provide overmatch capability versus a broad spectrum of hard targets. ***FY 2020 Plans:*** FY 2020 efforts were focused on continuing rapid prototyping/development of the SP projectile, built prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducted a Critical Design Review (CDR), and conducted prototype testing. Also, conducted a Preliminary Design Review (PDR) for the SP projectile and performed activities to increase prototype capacity to support planned weapon system testing beginning in FY 2021 and FY 2022. ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Project EP5 Adv Armor Piercing (ADVAP) Small Caliber Ammo and Project FL4 Small Caliber Ammo Next Gen Squad Weapons.			
Accomplishments/Planned Programs Subtotals	5.334	6.821	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP5: *Adv Armor-Piercing (ADVAP) for Small Caliber Ammo*	20.247	-	0.000	-	0.000	-	-	-	-	0.000	20.247
• FL4: *Small Caliber Ammo for Next Gen Squad Weapons*	-	18.180	30.600	-	30.600	28.723	24.976	11.739	11.858	0.000	126.076

Remarks

These funding lines support EMD activities for the 7.62mm ADVAP ammunition and rapid prototyping/development of GP and SP ammunition for the NGSW systems. Other Program Funding in Budget Activity 05 (BA 05) PE 0604802A, Project EP5 ADVAP for Small Cal Ammo and BA 05 PE 0604802A Weapons and Munitions - Eng Dev Project FL4 Small Caliber Ammo for Next Gen Squad Weapons

D. Acquisition Strategy

New ammunition development effort for Next Generation Squad Weapons (NGSW) systems, will utilize the MTA authority for rapid prototyping/rapid fielding. The project will utilize Government developed projectile designs that will be delivered to development contractors as Government Furnished Material (GFM). The Government will select up to three contractors for the weapon system development and down-select to a single contractor in FY 2021, prior to production contract award.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Projectile Development	Option/ CPFF	Northrop Grumman Innovation Systems : Independence, MO	-	1.046	Jan 2019	3.200	Jan 2020	-		-		-	Continuing	Continuing	Continuing
Ammo Cartridge Development 1	Option/ CPFF	Sig Sauer : Newington, NH	-	0.500		-		-		-		-	0.000	0.500	-
Ammo Cartridge Development 2	Option/ CPFF	General Dynamics : Florham Park, NJ	-	0.500		-		-		-		-	0.000	0.500	-
		Subtotal	-	2.046		3.200		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	6.387	1.680	Oct 2018	1.921	Oct 2019	-		-		-	Continuing	Continuing	Continuing
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	1.000	1.608	Oct 2018	1.000	Oct 2019	-		-		-	Continuing	Continuing	Continuing
		Subtotal	7.387	3.288		2.921		-		-		-	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	3.200	-		0.500	Oct 2019	-		-		-	Continuing	Continuing	Continuing
U.S. Army Aberdeen Test Center	TBD	Aberdeen : Maryland	-	-		0.200	Oct 2019	-		-		-	Continuing	Continuing	Continuing
		Subtotal	3.200	-		0.700		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	10.587	5.334		6.821		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*

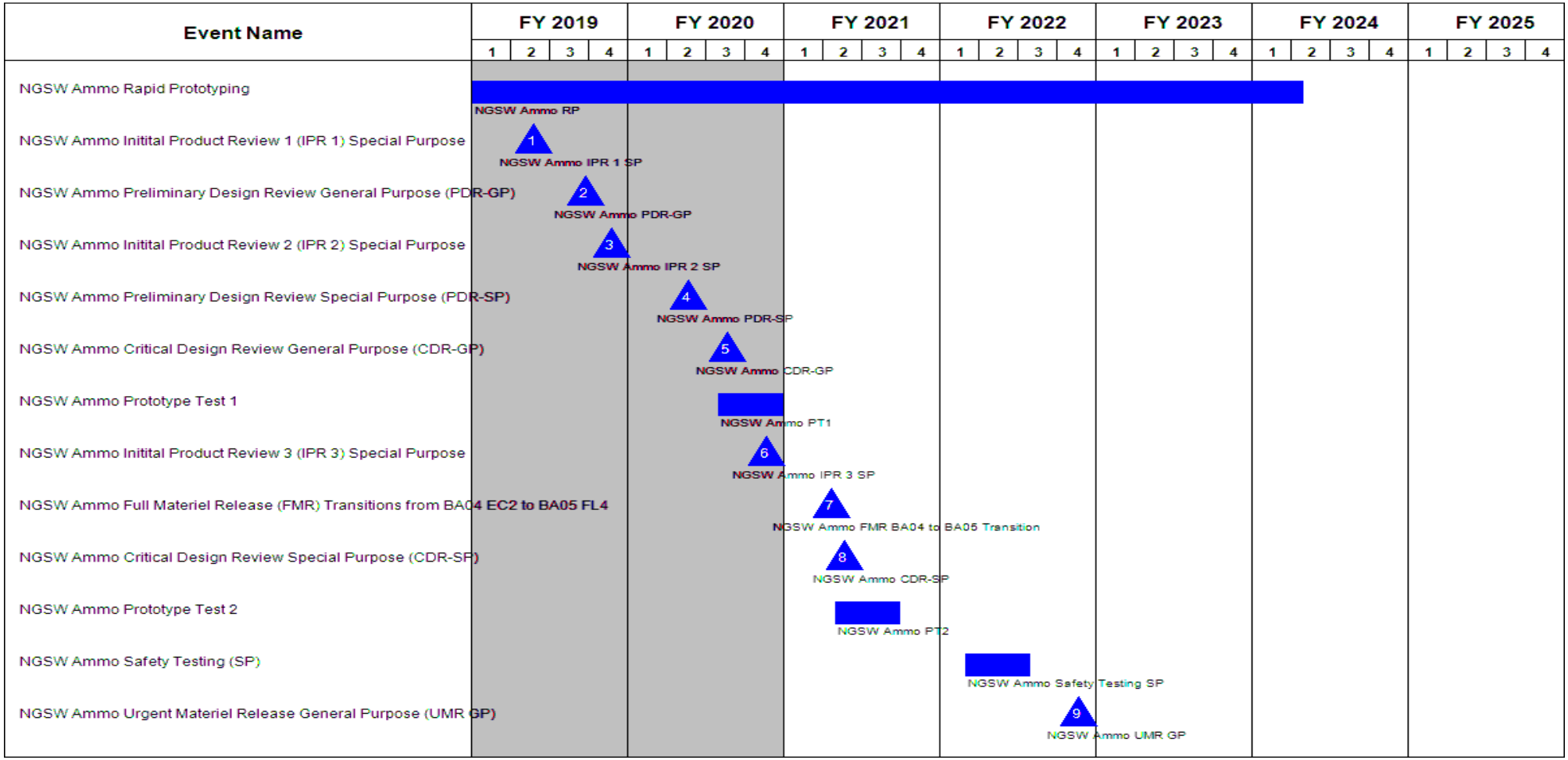

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*

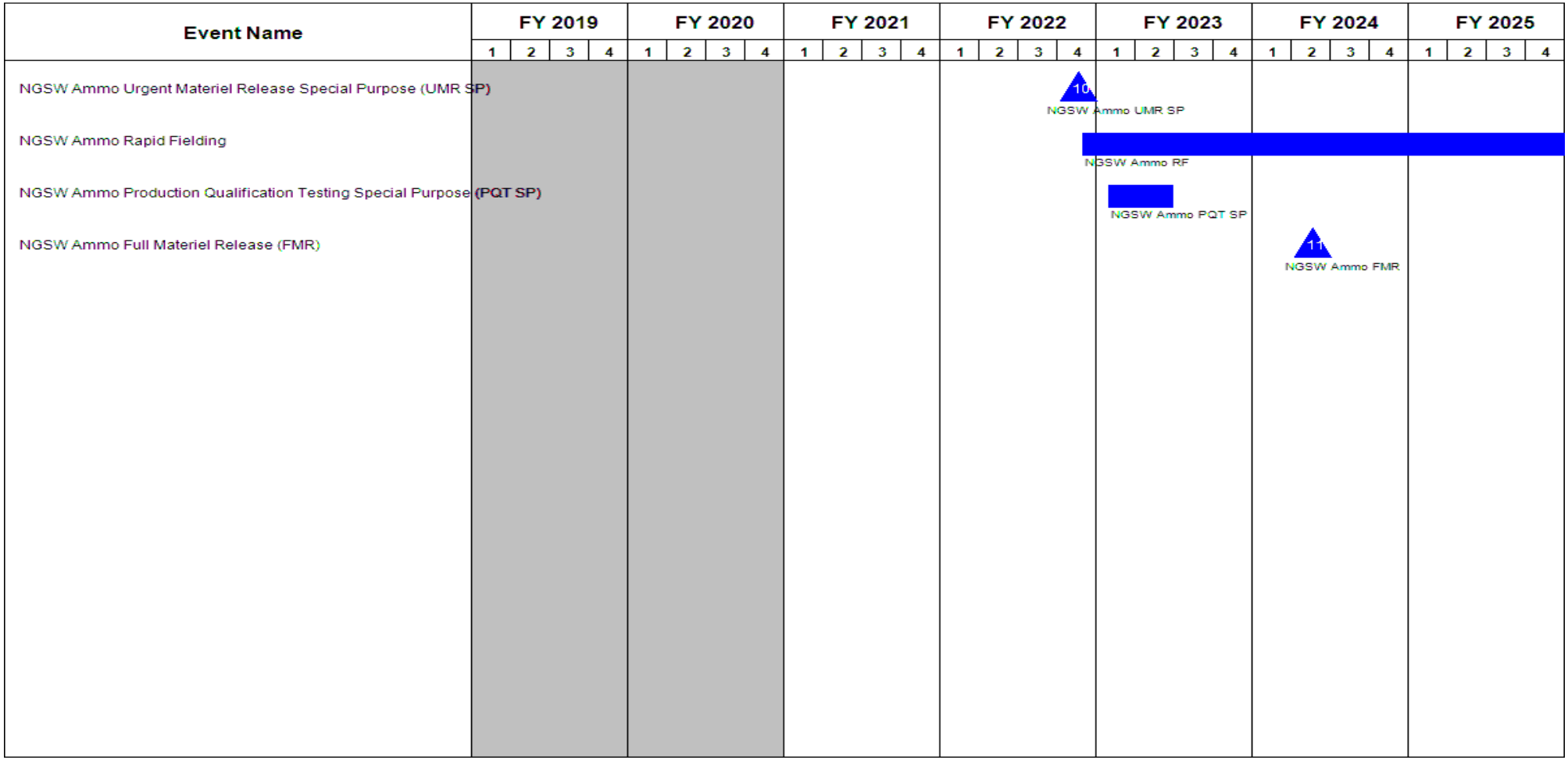

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC2 / *Adv Armor-Piercing (ADVAP) for Small Cal Ammo*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
NGSW Ammo Rapid Prototyping	1	2019	2	2024
NGSW Ammo Initital Product Review 1 (IPR 1) Special Purpose	2	2019	2	2019
NGSW Ammo Preliminary Design Review General Purpose (PDR-GP)	3	2019	3	2019
NGSW Ammo Initital Product Review 2 (IPR 2) Special Purpose	4	2019	4	2019
NGSW Ammo Preliminary Design Review Special Purpose (PDR-SP)	2	2020	2	2020
NGSW Ammo Critical Design Review General Purpose (CDR-GP)	3	2020	3	2020
NGSW Ammo Prototype Test 1	3	2020	4	2020
NGSW Ammo Initital Product Review 3 (IPR 3) Special Purpose	4	2020	4	2020
NGSW Ammo Full Materiel Release (FMR) Transitions from BA04 EC2 to BA05 FL4	2	2021	2	2021
NGSW Ammo Critical Design Review Special Purpose (CDR-SP)	2	2021	2	2021
NGSW Ammo Prototype Test 2	2	2021	3	2021
NGSW Ammo Safety Testing (SP)	1	2022	3	2022
NGSW Ammo Urgent Materiel Release General Purpose (UMR GP)	4	2022	4	2022
NGSW Ammo Urgent Materiel Release Special Purpose (UMR SP)	4	2022	4	2022
NGSW Ammo Rapid Fielding	4	2022	1	2026
NGSW Ammo Production Qualification Testing Special Purpose (PQT SP)	1	2023	2	2023
NGSW Ammo Full Materiel Release (FMR)	2	2024	2	2024

Note

Note: Next Generation Squad Weapon (NGSW)

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EC3 / *Ammunition Logistics Prototyping*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EC3: *Ammunition Logistics Prototyping*	-	1.271	1.525	1.713	-	1.713	2.168	1.798	1.834	1.870	0.000	12.179
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project supports the future force by improving the distribution, management, reliability and survivability of ammunition through the advanced development, integration, and demonstration of logistics system enablers. These enablers will improve the efficiency and effectiveness of ammunition operations, to include retrograde, while reducing the logistics footprint on the battlefield. Technology areas addressed include handling, distribution, and management (strategic and tactical), prognostics, diagnostics, and asset visibility, explosives safety, and adaptive and environmentally friendly packaging and palletization. The efficient deployment and sustainment of reliable ammunition is vital to success on the battlefield. This Project enhances the operational effectiveness of the ammunition logistics system to ensure the distribution of reliable ammunition to the warfighter. Fiscal Year (FY) 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices as well as verifying that issues found during testing have been resolved. FY 2021 funding will also be used to demonstrate a suite of monitoring technologies, which will be used for assessing munitions reliability. All research and development initiatives will be supporting the cross functional teams and the multi domain operations modernization objectives through deployment of prototypes for user evaluation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Munitions Health and Inventory Monitoring Systems	1.271	0.991	1.213
Description: Performance and reliability of certain munitions can be degraded by the environmental exposure history they experience during their lifetime. This Project will develop simple to complex environmental health and inventory monitoring systems to improve reliability and asset visibility and enable effective Condition Based Management for Ammunition.			
FY 2020 Plans: Conducted an extended operational demonstration of the environmental health monitoring system to enable condition based management of ammunition. Continued verification testing of a type II prototype next generation temperature/humidity sensor with batch interrogation and historical data retention capabilities for the assessment of munition reliability and completed an operational demonstration of the type I prototype. Completed operational demonstration of the low cost thermal indicator, which provides passive lifetime temperature exposure sensing.			
FY 2021 Plans: Conduct verification testing of a type II prototype next generation temperature/humidity sensor. Conduct verification testing of alternative form factor munitions health monitoring system on multiple packaging types. Conduct an assessment on the value of storing data in various formats from data rich to highly summarized to support a business case analysis of the transfer and long			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC3 / *Ammunition Logistics Prototyping*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
term storage of data in an overarching data system. Conduct environmental testing on phase 2 health monitoring suite (RRAPDS) prototypes. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Slight increase in labor costs.			
Title: Munitions Containerization Systems ***Description:*** For each family of munitions containers, optimize prototype container systems for automation compatibility, combat unit load quantity, sustainability/recyclability, Insensitive Munitions/explosives safety, environmental protection, load reconfiguration, unitization, and standardized interfaces. This will improve ammunition distribution efficiency while minimizing environmental and operational impacts. ***FY 2020 Plans:*** Performed qualification testing of production representative rectangular polymer container for family of 5.56 millimeter (mm) ammunition. Performed advanced development and prototype demonstration of the plastic cylindrical container in a realistic operating environment. ***FY 2021 Plans:*** Conduct test and evaluation on injection molded cylindrical container for integration with 105mm tank ammunition. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The slight increase from FY 2020 to FY 2021 is due to labor rate increases.	-	0.465	0.500
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.069	-
Accomplishments/Planned Programs Subtotals	1.271	1.525	1.713

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC3 / *Ammunition Logistics Prototyping*

D. Acquisition Strategy

Munitions Health Monitoring and Munitions Containerization systems will be developed through government and industry prototype efforts. FY 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices as well as verifying that issues found during testing have been resolved.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EC3 / *Ammunition Logistics Prototyping*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.069		-		-		-	0.000	0.069	-
		Subtotal	-	-		0.069		-		-		-	0.000	0.069	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Next Generation Temperature Humidity Indicator	C/FFP	AGM : Tuscon, AZ	0.406	0.472	Aug 2019	0.387	Dec 2019	0.450	Mar 2021	-		0.450	0.000	1.715	-
Contract - Low Cost Thermal Indicator	C/FFP	Innosense : Torrance, CA	2.139	0.392	Aug 2019	0.186	Dec 2019	-		-		-	0.000	2.717	-
Contract - Remote Readiness Asset Prognostic/Diagnostic System (RRAPDS)	C/FFP	Karagozian & Case : Glendale, CA	1.152	-		-		0.450	Jun 2021	-		0.450	0.000	1.602	-
Contract-Plastic Cylindrical Container	C/FFP	SAVIT : Rockaway, NJ	0.647	-		0.261	Mar 2020	0.200	Mar 2021	-		0.200	0.000	1.108	-
Contract-Plastic Rectangular Container	C/FFP	Polymer Technologies Inc. : Clifton, NJ	-	-		-		0.200	Mar 2021	-		0.200	0.000	0.200	-
		Subtotal	4.344	0.864		0.834		1.300		-		1.300	0.000	7.342	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : NJ	3.593	0.407	Dec 2018	0.386	Dec 2019	0.213	Dec 2020	-		0.213	0.000	4.599	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EC3 / *Ammunition Logistics Prototyping*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	3.593	0.407		0.386		0.213		-		0.213	0.000	4.599	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Yuma Proving Ground	MIPR	Yuma : AZ	0.086	-		-		-		-		-	0.000	0.086	-
Test and Evaluation	MIPR	TBD : TBD	0.150	-		0.236	Mar 2020	0.200	Mar 2021	-		0.200	0.000	0.586	-
		Subtotal	0.236	-		0.236		0.200		-		0.200	0.000	0.672	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	8.173	1.271		1.525		1.713		-		1.713	0.000	12.682	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC3 / *Ammunition Logistics Prototyping*

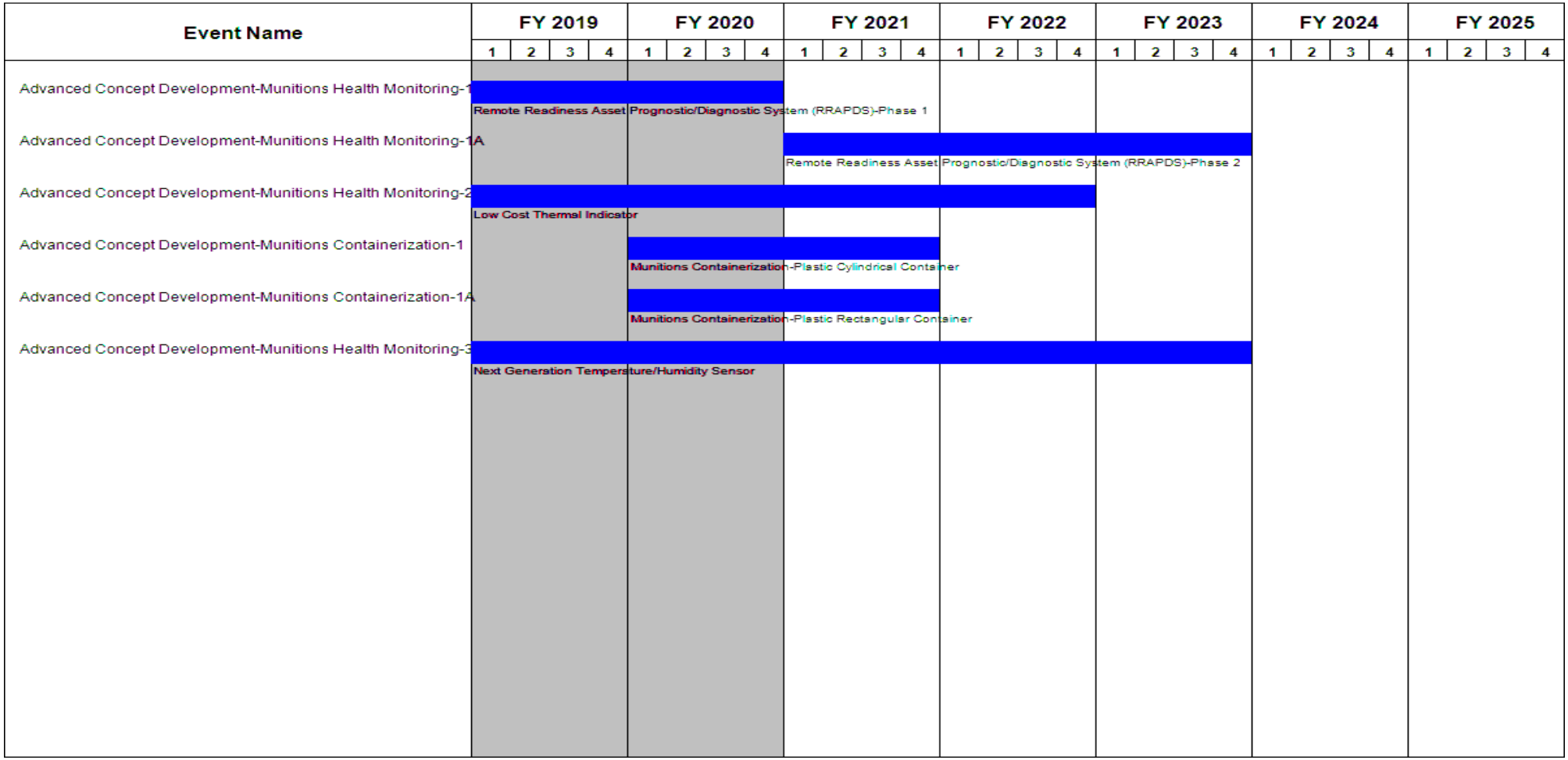

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EC3 / *Ammunition Logistics Prototyping*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Advanced Concept Development-Munitions Health Monitoring-1	2	2015	4	2020
Advanced Concept Development-Munitions Health Monitoring-1A	1	2021	4	2023
Advanced Concept Development-Munitions Health Monitoring-2	2	2015	4	2022
Advanced Concept Development-Munitions Containerization-1	1	2020	4	2021
Advanced Concept Development-Munitions Containerization-1A	1	2020	4	2021
Advanced Concept Development-Munitions Health Monitoring-3	3	2017	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EL7 / *Reduced Range Ammunition*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EL7: *Reduced Range Ammunition*	-	2.090	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.090
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62 millimeter (mm) and .50 caliber Capabilities Development Documents (CDD). The overall objective of RRA is to provide training ammunition suitable for use on military installations with Surface Danger Zone (SDZ) restrictions. The relatively long maximum range of the 7.62mm and .50 caliber service ammunition poses challenges on training ranges in range restricted areas. RRA will mitigate a training gap on installations by providing a materiel solution that meets training needs while shortening and condensing the SDZ. This will allow soldiers to train with 7.62mm and .50 caliber weapons on restricted ranges. The RRA cartridge design will be compatible with all Army 7.62mm and .50 caliber weapons but specifically optimized to work in the M240 and M2 Machine Guns. There is no funding requested in Fiscal Year (FY) 2021.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR) ***Description:*** Develop, demonstrate, and qualify small caliber 7.62mm and .50 caliber ammunition that will provide a reduced range training capability to the M240 and M2 gunners.	2.090	-	-
Accomplishments/Planned Programs Subtotals	2.090	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP3: *Reduced Range Ammunition - Small Caliber*	4.432	8.376	15.377	-	15.377	14.873	5.095	-	-	0.000	48.153

Remarks

The 7.62mm effort under Budget Activity 04 Program Element (PE) 0603639A, Project EL7, Reduced Range Ammunition (RRA), transitioned in FY 2019 to Budget Activity 05 PE 0604802A, Project EP3, Reduced Range Ammunition - Small Caliber. Under PE 0604802A, Project EP3, Reduced Range Ammunition (RRA) funding continues the development work of 7.62mm and supports Engineering and Manufacturing Development (EMD) and development work on the .50 Caliber variant which transitions in FY 2020.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*

D. Acquisition Strategy

After 7.62mm Milestone (MS) B in FY 2019, the Government intends to award Engineering and Manufacturing Development (EMD) contracts. The Government will then award competitive contracts for 7.62mm Pre-Production Qualification Testing (PPQT) hardware in FY 2020 and down-select to a single contractor to complete EMD. The .50 Caliber program follows a similar strategy. The Government intends to award multiple competitive contracts for the .50 Caliber EMD.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Contract # 1	C/CPFF	General Dynamics : Florham Park, NJ	-	0.770	Jan 2019	-		-		-		-	0.000	0.770	-
Development Contract # 2	C/CPFF	Nammo Tally : Mesa, AZ	-	0.770	Jan 2019	-		-		-		-	0.000	0.770	-
		Subtotal	-	1.540		-		-		-		-	0.000	1.540	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	3.133	0.550	Oct 2018	-		-		-		-	0.000	3.683	-
Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	0.430	-		-		-		-		-	0.000	0.430	-
		Subtotal	3.563	0.550		-		-		-		-	0.000	4.113	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
US Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	0.327	-		-		-		-		-	0.000	0.327	-
Prototype testing	C/FFP	Double B Enterprises : Malvern, OH	0.052	-		-		-		-		-	0.000	0.052	-
		Subtotal	0.379	-		-		-		-		-	0.000	0.379	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EL7 / *Reduced Range Ammunition*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.942	2.090		0.000		-		-		-	0.000	6.032	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*

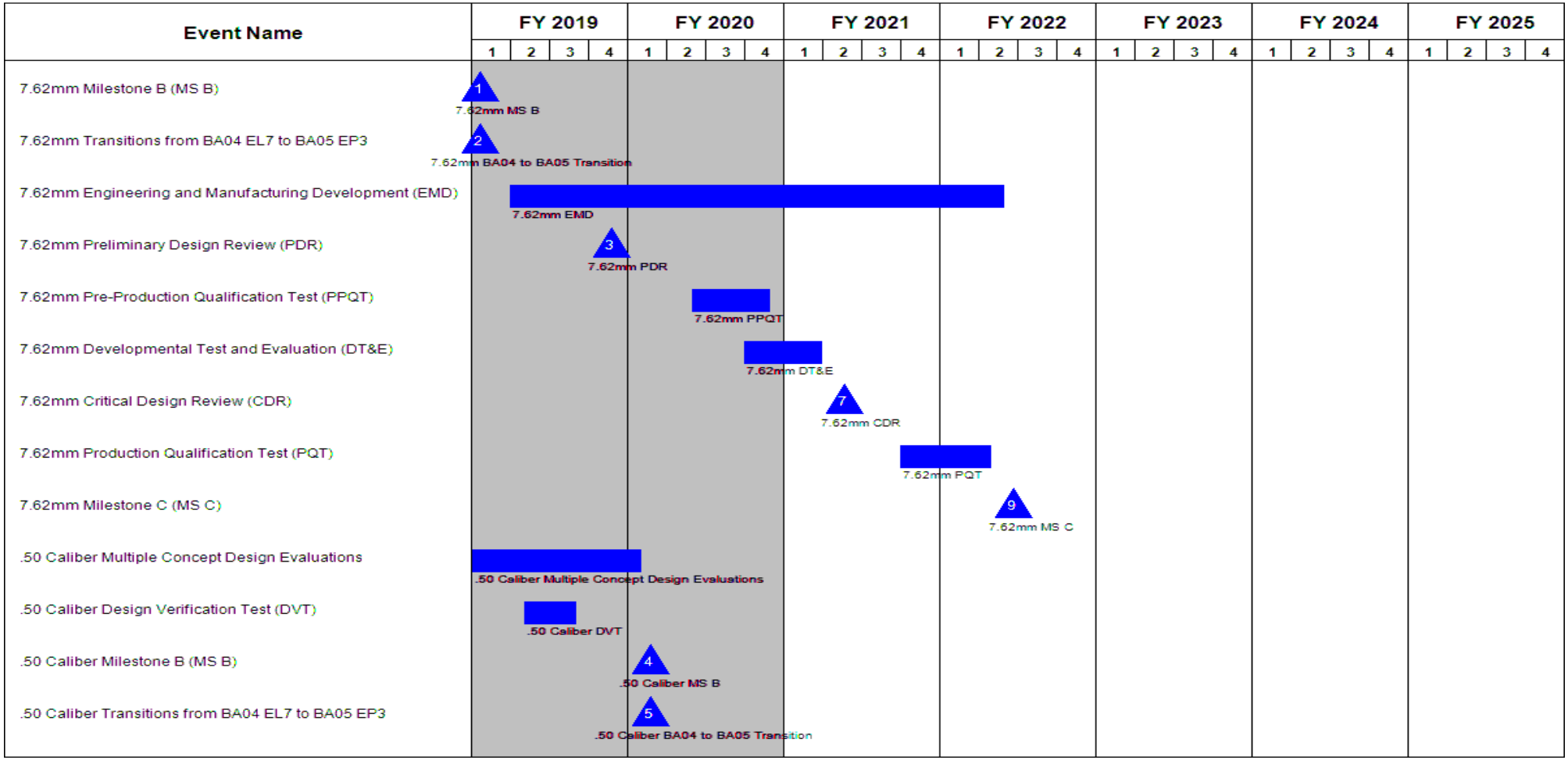

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*

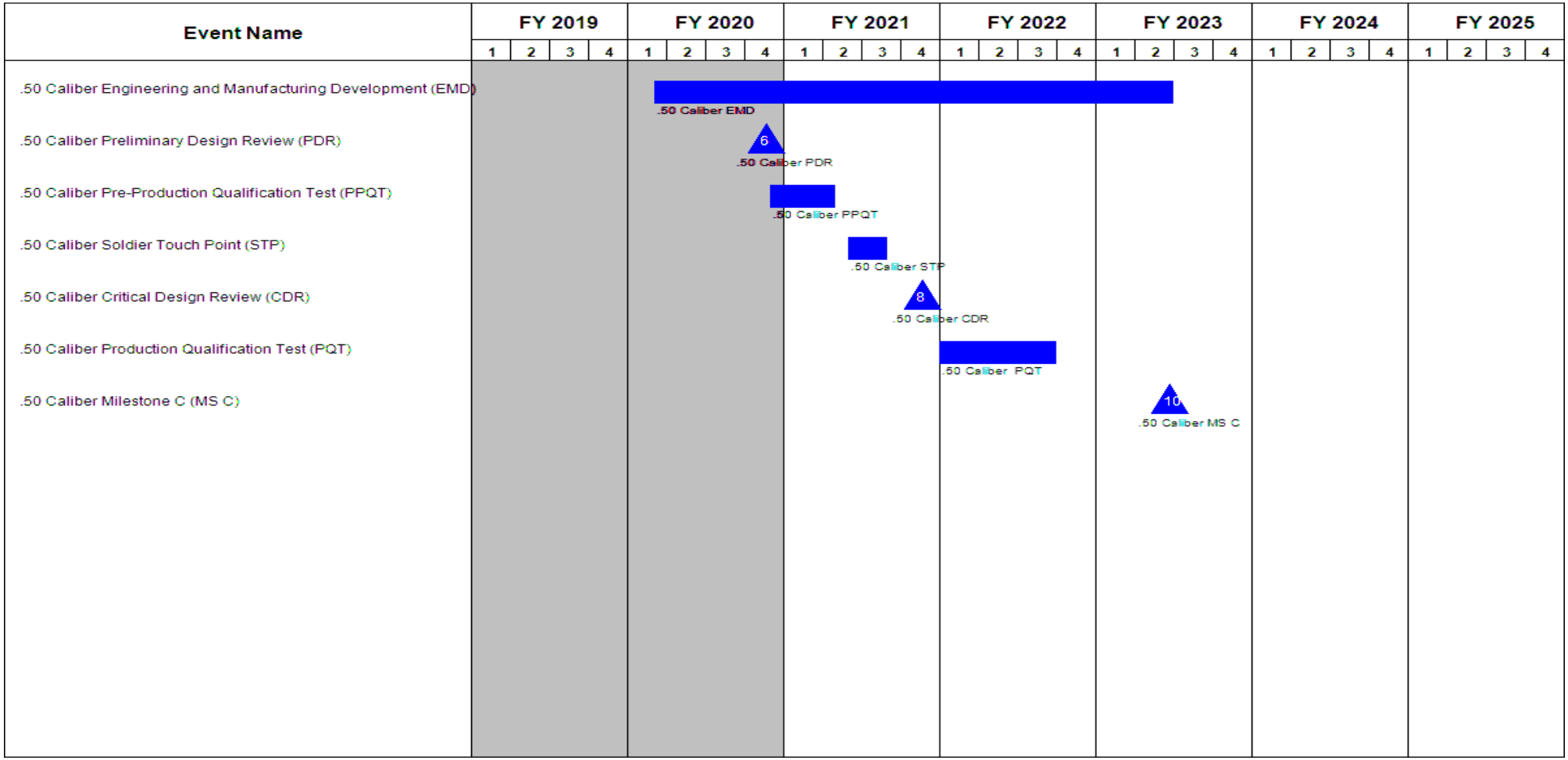

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
7.62mm Multiple Concept Design Evaluations	1	2017	4	2018
7.62mm Materiel Development Decision (MDD)	4	2017	4	2017
7.62mm Design Verification Test (DVT)	2	2018	3	2018
7.62mm Milestone B (MS B)	1	2019	1	2019
7.62mm Transitions from BA04 EL7 to BA05 EP3	1	2019	1	2019
7.62mm Engineering and Manufacturing Development (EMD)	1	2019	2	2022
7.62mm Preliminary Design Review (PDR)	4	2019	4	2019
7.62mm Pre-Production Qualification Test (PPQT)	2	2020	4	2020
7.62mm Developmental Test and Evaluation (DT&E)	4	2020	1	2021
7.62mm Critical Design Review (CDR)	2	2021	2	2021
7.62mm Production Qualification Test (PQT)	4	2021	2	2022
7.62mm Milestone C (MS C)	2	2022	2	2022
.50 Caliber Project Starts on BA04 EL7	1	2018	1	2018
.50 Caliber Multiple Concept Design Evaluations	1	2018	1	2020
.50 Caliber Materiel Development Decision (MDD)	2	2018	2	2018
.50 Caliber Design Verification Test (DVT)	2	2019	3	2019
.50 Caliber Milestone B (MS B)	1	2020	1	2020
.50 Caliber Transitions from BA04 EL7 to BA05 EP3	1	2020	1	2020
.50 Caliber Engineering and Manufacturing Development (EMD)	1	2020	2	2023
.50 Caliber Preliminary Design Review (PDR)	4	2020	4	2020
.50 Caliber Pre-Production Qualification Test (PPQT)	4	2020	2	2021
.50 Caliber Soldier Touch Point (STP)	2	2021	3	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EL7 / *Reduced Range Ammunition*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
.50 Caliber Critical Design Review (CDR)	4	2021	4	2021
.50 Caliber Production Qualification Test (PQT)	1	2022	3	2022
.50 Caliber Milestone C (MS C)	2	2023	2	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EU3: *.50 Caliber All-Purpose Tactical Cartridge (APTC)*	-	0.000	4.250	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.250
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2021, the small caliber All-Purpose Tactical Cartridge (APTC) Project transitions to Budget Activity 05 (BA 05) Program Element (PE) 0604802A, Project EU5, .50 Caliber All-Purpose Tactical Cartridge (APTC) to continue development work and support Engineering and Manufacturing Development (EMD).

A. Mission Description and Budget Item Justification

The APTC project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of APTC is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The APTC will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. There is no FY 2021 funding request.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR)	-	4.057	-
Description: Develop, demonstrate, and qualify new .50 Caliber ammunition to replace and/or improve current legacy .50 Caliber variants. ***FY 2020 Plans:*** Built, evaluated, and refined .50 Caliber APTC concepts/prototypes and performed Milestone B preparation activities. Evaluated M8 Armor Piercing Incendiary (API), M20 API Trace, M903 Saboted Light Armor Penetrator (SLAP), and M962 SLAP Trace ammunition for improvements that would satisfy the .50 APTC requirement. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The effort under Budget Activity 04, Program Element (PE) 0603639A, Project EU3, .50 Caliber APTC, transitions in FY 2021 to Budget Activity 05, PE 0604802A, Project EU5.			
Title: FY 2020 SBIR/STTR Transfer	-	0.193	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	4.250	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EU5: *.50 Caliber All-Purpose Tactical cartridge (APTC)*	-	-	8.491	-	8.491	9.390	-	-	11.989	0.000	29.870

Remarks

Project EU3 A.50 Caliber APTC funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev, Project EU5, .50 Caliber All-Purpose Tactical Cartridge (APTC).

D. Acquisition Strategy

Evaluate competing concepts/prototypes from contractors and Government. In FY 2021, the Government intends to select up to two competing contractors to begin Engineering and Manufacturing Development (EMD). In FY 2022, the Government intends to select a single contractor to complete final qualification and testing in preparation for the transition to production in FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.193		-		-		-	0.000	0.193	-
		Subtotal	-	-		0.193		-		-		-	0.000	0.193	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prototype Development	C/CPFF	To be Determined : To be Determined	-	-		2.435	Jan 2020	-		-		-	Continuing	Continuing	Continuing
		Subtotal	-	-		2.435		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	-	-		0.936	Jan 2020	-		-		-	Continuing	Continuing	Continuing
		Subtotal	-	-		0.936		-		-		-	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Verification Testing	MIPR	Army Research Lab (ARL) : Maryland	-	-		0.686	Jan 2020	-		-		-	Continuing	Continuing	Continuing
		Subtotal	-	-		0.686		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		4.250		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*

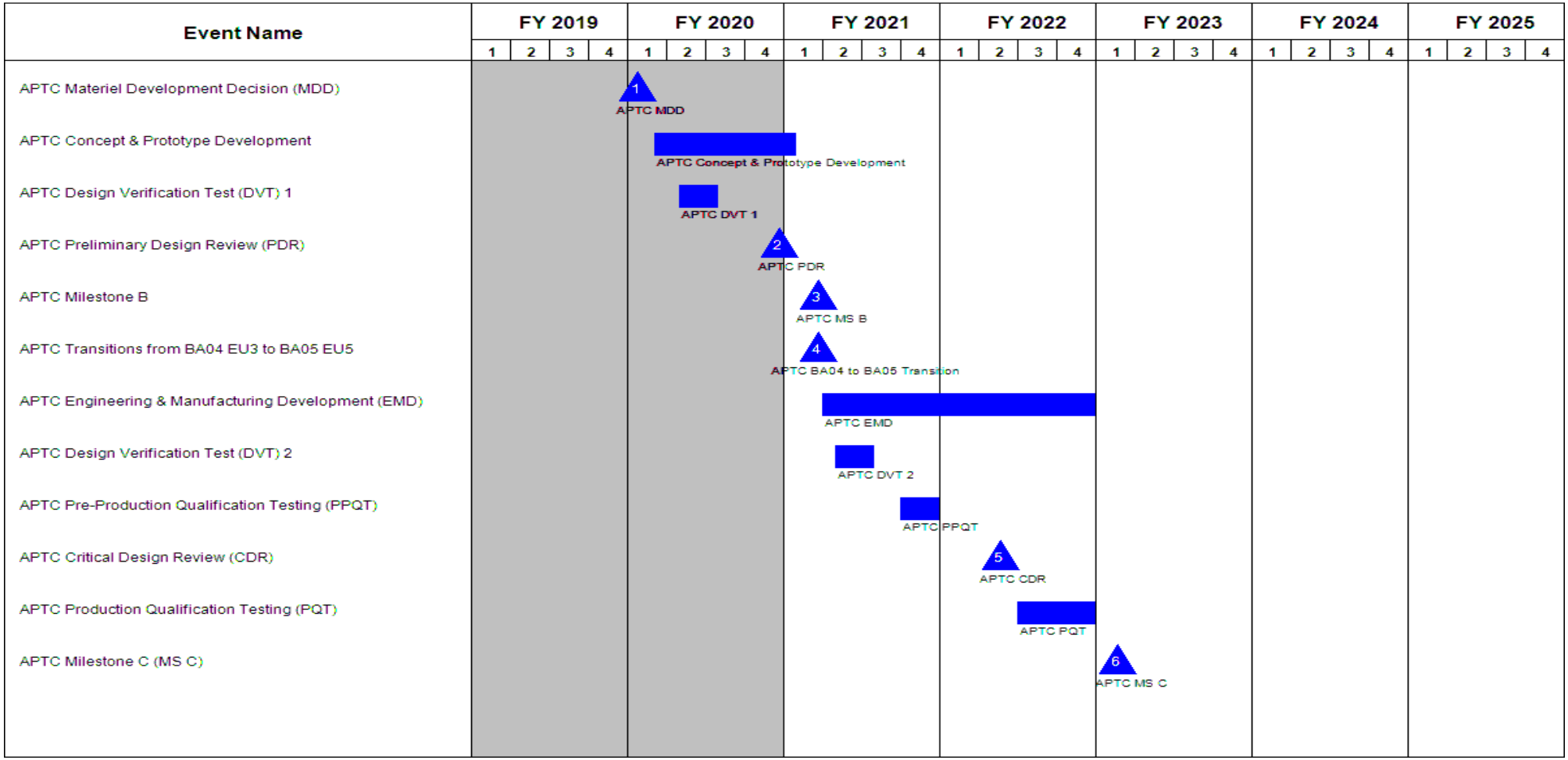

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** EU3 / *.50 Caliber All-Purpose Tactical Cartridge (APTC)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
APTC Materiel Development Decision (MDD)	1	2020	1	2020
APTC Concept & Prototype Development	1	2020	1	2021
APTC Design Verification Test (DVT) 1	2	2020	3	2020
APTC Preliminary Design Review (PDR)	4	2020	4	2020
APTC Milestone B	1	2021	1	2021
APTC Transitions from BA04 EU3 to BA05 EU5	1	2021	1	2021
APTC Engineering & Manufacturing Development (EMD)	2	2021	4	2022
APTC Design Verification Test (DVT) 2	2	2021	3	2021
APTC Pre-Production Qualification Testing (PPQT)	4	2021	4	2021
APTC Critical Design Review (CDR)	2	2022	2	2022
APTC Production Qualification Testing (PQT)	3	2022	4	2022
APTC Milestone C (MS C)	1	2023	1	2023

Note

Note: All-Purpose Tactical Cartridge (APTC)

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) FA5 / *Assured Precision Weapons and Munitions*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FA5: *Assured Precision Weapons and Munitions*	-	13.797	31.267	29.878	-	29.878	30.971	30.971	24.977	12.133	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Assured Precision Weapons and Munitions (APWM) - FA5 Project is focused on advanced risk mitigation, technology integration, prototyping, and product support to identify, evaluate, mature, test, and demonstrate various assured precision prototype technologies in weapon and munitions components and subsystems within a complex system of systems environment. The APWM Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping, which increases lethality and ensures future combat overmatch success of the Joint Force against peer/near-peer adversaries. This project also aims to improve program performance and affordability for multiple weapons and munitions Programs of Record (PoRs) via Joint Lethality Positioning, Navigation and Timing (PNT) and Army M-Code Global Positioning System (GPS) coordinated efforts. The APWM Project directly supports top Army Modernization Priorities via the Assured-PNT (A-PNT) and Long Range Precision Fires (LRPF) Cross Functional Team (CFT) imperatives in support of the National Defense Strategy. Funding will support engagement by Weapons and Munitions PNT experts in the development, evaluation, and technology delivery activities of the Air Force's M-Code GPS, Army's PNT related programs, and A-PNT CFT programs in support of LRPF and Counter Area Access/Area Denial missions. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a NavWar system-of-systems environment, Army M-Code GPS technology integration and evaluation, planning for next generation M-Code GPS integration into the Long Range Precision Guidance Kit (LR-PGK) as the Department of Defense-selected representative Joint precision munition, and maturation of alternative PNT related technologies and solutions to enable informed A-PNT related PoR milestone and Army cross-functional modernization decisions.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: APWM Integrated Product Support - Joint Lethality PNT SME Working Integrated Product Team (WIPT) & Program Management	2.255	3.397	3.616
Description: Provide assured precision weapons and munitions technical subject matter expertise and support to the Joint oversight board for assured precision weapons and munitions. Provide overall APWM Project Program Management support.			
FY 2020 Plans: The subject matter experts continued to coordinate with and supported the development and technology delivery activities of the Air Force?s Military GPS User Equipment (MGUE) program and the Army?s A-PNT program including participation in design reviews, evaluation and formal feedback on technology and systems requirements and performance, component and subsystem architecture input essential for precision weapons and munitions operating in a system-of-systems environment, and configuration			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FA5 / *Assured Precision Weapons and Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
management of the evolving Joint Common GPS Specification and Interface Control Document for Precision Guided Munitions (PGMs). Specific support focus included requirements for MGUE Increment 2 and alternative PNT technology maturity. ***FY 2021 Plans:*** The subject matter experts will continue coordinating with and supporting the development and technology delivery activities of the A-PNT CFT, Air Force?s MGUE program and the Army?s PNT related programs including participation in design reviews, evaluation and formal feedback on technology and systems requirements and performance, component and subsystem architecture input essential for precision weapons and munitions operating in a system-of-systems environment, and configuration management of the evolving Joint Common GPS Specification and Interface Control Document for PGMs. Specific support focus includes requirements for MGUE Increment 2 and alternative PNT technology maturity. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Level of effort required in Fiscal Year (FY) 2021 is slightly higher than FY 2020 due to A-PNT CFT and Air Force?s MGUE program efforts maturing and impacting collaborative efforts for the Joint Lethality community.			
Title: Assured PNT related Integration Risk Mitigation - A-PNT for Family of Scatterable Mines (FASCAM) Replacement ***Description:*** Evaluate, mature and test A-PNT system/subsystem components for terrain shaping enabling technologies. ***FY 2020 Plans:*** Down-select assured precision technologies including A-PNT technologies for future terrain shaping PoR communication capabilities through modeling and simulation based verification to initiate corresponding technology demonstrations. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Modeling and Simulation, Prototyping, and proof of concept evaluations of A-PNT technologies supporting terrain shaping PoR conclude in FY 2020 . Evaluation and design reports will support transition of A-PNT technologies to the terrain shaping PoR significantly reducing integration risk.	0.767	1.904	-
Title: Assured PNT related Integration Risk Mitigation - Network Assisted A-PNT (NA2) for Weapons & Munitions Phase 1 ***Description:*** Evaluate, mature and demonstrate technologies for modifying Network Assisted GPS (NA GPS) and associated data exchange that support Alternative PNT and M-Code for Weapons and Munitions.	6.300	-	-
Title: Assured PNT related Integration Risk Mitigation - NA2 for Weapons and Munitions Phase 2 ***Description:*** Perform NA2 systems of systems capability integration and pre system qualification integration risk reduction activities. Improve initial prototype NA2 capability and initiate improved prototype for subsequent transition to corresponding PoRs. Inform future NAVWAR related weapons and munitions platform dependencies. Integrate and synchronize AltNav capability	-	5.494	3.700

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FA5 / *Assured Precision Weapons and Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
delivery within NA2 to meet A-PNT CFT AltNav Directed Requirement which summarizes the urgent need for AltNav initial operational capability in two Brigade Combat Teams NLT 1QFY24. ***FY 2020 Plans:*** Included down-selected alternative Positioning, Navigation and Timing (PNT) technologies from initial Network Assisted Assured-PNT phase 1 prototype into improved phase 2 Network Assisted Assured-PNT system of system prototype solution. Performed Network Assisted Assured-PNT systems of systems capability integration and pre-system qualification integration risk reduction activities and finalize prototype software solutions. ***FY 2021 Plans:*** Perform Assured PNT system-of-systems integration risk reduction activities. Refine NA2 sub-system prototype software. Conduct full system of systems integration test event for NA2 to mitigate risk of transitioning NA2 capability to the field via multiple Programs of Record to meet A-PNT CFT AltNav Directed Requirement for Initial Operational Capability in FY 2024. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Majority of sub-system prototype software will be completed in FY 2020. FY 2021 focuses on refining prototype software solutions based on FY 2020 integration risk reduction activities and conducting a full system-of-systems integration developmental test which requires less effort than FY 2020 activities.			
Title: Assured PNT related Integration Risk Mitigation - NA2 for Guided Rocket/Missile Launcher Systems	-	2.823	2.000
Description: Perform software development and prototyping activities to demonstrate NA2 capability for Rocket/Missile artillery launcher systems. Integrate and demonstrate upgraded artillery launcher system into the NA2 systems of systems networked capability to reduce subsequent PoR fielding risks. Integrate and synchronize AltNav capability delivery within NA2 to meet A-PNT CFT AltNav Directed Requirements which summarizes the urgent need for AltNav initial operational capability in two Brigade Combat Teams NLT 1QFY24. ***FY 2020 Plans:*** Conducted requirements refinement activities and initiated software development and prototyping activities to provide initial Network Assisted Assured-PNT (NA2) capability for Rocket/Missile artillery launcher systems. Initiated prototyping risk mitigation activities for Rocket/Missile artillery launcher systems. ***FY 2021 Plans:*** Perform Assured PNT Rocket/Missile system-of-systems integration risk reduction activities. Refine Rocket/Missile artillery launcher NA2 prototype software. Conduct full system-of-systems integration developmental test event utilizing Rocket/Missile			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FA5 / *Assured Precision Weapons and Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
artillery launchers for NA2 to mitigate risk of transitioning NA2 capability to the field to meet A-PNT CFT AltNav Directed Requirement for Initial Operational Capability in FY 2024. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Majority of Rocket/Missile artillery launcher software will be completed in FY 2020. FY 2021 focuses primarily on risk reduction integration activities which requires less effort than FY 2020 activities.			
Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for PGM Fuze Setter ***Description:*** Develop, prototype, and evaluate required emerging A-PNT technology enhancements to the PGM Fuze Setter needed to enable continued performance of PGMs) in a realistic operational threat environment.	2.137	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for Towed Howitzer Platforms ***Description:*** Prototype and evaluate MGUE Increment 1 (M-code) GPS receiver cards in the M777A2 and M119A3 Towed Howitzer Platforms and evaluate technologies for providing Assured PNT to PGMs.	0.472	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - Alternative Navigation Technologies (AltNav) Phase 1 ***Description:*** Develop, prototype, and evaluate non-Global Positioning System Radio Frequency (Non-GPS RF) Navigation prototype systems for indirect fires, including Long Range Precision Fires.	1.866	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - AltNav Technologies (AltNav) Phase 2 ***Description:*** Conduct rapid development and prototyping of AltNav receivers for precision guided munitions (PGMs) and assess operational feedback (receivers, enterprise service, and integration)of solutions to maximize utility of AltNav for LRPF meeting the intent of the A-PNT CFT AltNav Directed Requirement. Demonstrate and conduct performance assessments of potential hardware and software solutions to support Artillery integration efforts as well as inform future Space-based PNT related alternatives for the Land Combat domain. ***FY 2020 Plans:*** Designed and developed an Alternative Navigation (AltNav) capable hardware and software prototype for Precision Guided Munition (PGM) applications to demonstrate and quantify AltNav performance. Performed integration efforts with the hardware and software prototype to conduct a ride-along performance evaluation of AltNav in a PGM environment. ***FY 2021 Plans:***	-	4.962	3.175

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FA5 / *Assured Precision Weapons and Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Perform AltNav prototype integration activities to facilitate and conduct guide-to-hit PGM experiments. Generate AltNav performance evaluation and technology transition reports that meet the intent of the A-PNT CFT AltNav Directed Requirement. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Majority of integration and risk reduction activities will occur in FY 2020. FY 2021 will focus on completing integration activities and preparing for and performing guide-to-hit experiments which requires less effort than FY 2020 activities.			
Title: Assured PNT related Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS) ***Description:*** Development and integration of prototype LADS to demonstrate an assured weapon survey capability within the M777A2 and M119A3 Howitzer Platforms ***FY 2020 Plans:*** Development and integration of prototype Location Azimuth Determination System (LADS) into the M777A2 and M119A3 Howitzer Platforms. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** LADS prototyping, evaluation reports, and technical documentation will be completed in FY 2020. Technology transitions to Program of Record (PoR) in FY 2021.	-	1.223	-
Title: Army M-Code Technology Integration and Evaluation ***Description:*** Provide technical assessment, coordination, and engineering support related to the development, prototyping, integration, and evaluation of Air Force?s MGUE technology deliverables across all Army Weapons and Munitions, including participation in design reviews, testing, evaluation, and formal feedback on technology, component-level, card-level, sub-system-level, and systems-level requirements and performance. Reduce risk, support, and inform M-Code GPS related Army cross-functional modernization decisions for weapons and munitions operating in a peer/near threat system-of-systems environment as well as identifying complementary PNT solutions when M-Code GPS is not solely sufficient to enable Combat Overmatch. ***FY 2020 Plans:*** Established an Army M-Code GPS Weapons and Munitions Integrated Product Team (IPT). Initiated the definition, documentation, and representation of requirement and performance based needs for Army Weapons and Munitions to influence the Air Force?s Military GPS User Equipment (MGUE) technology investments, including low power and high performance cross-functional Land Combat applications. Established a centralized Army evaluation and experimentation mechanism to assess the effectiveness of M-Code GPS focused weapon and munition platform capabilities operating in a peer/near Positioning, Navigation and Timing (PNT) threat system-of-systems environment. ***FY 2021 Plans:***	-	9.022	12.101

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Lead an Army M-Code GPS Weapons and Munitions IPT and influence the Air Force?s MGUE technology investments via established requirements and performance based needs for Army Weapons and Munitions. Lead a centralized Army evaluation, prototyping, and experimentation mechanism to assess the effectiveness of M-Code GPS focused weapon and munition platform capabilities operating in a peer/near PNT threat system-of-systems environment. Lead a multi-organizational IPT to execute study, analysis, and integration imperatives for the Army M-Code Task Force. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 focuses on executing technology integration and migration strategies developed in FY 2020; as well as, actively participating in development of next generation M-Code technology which requires an increased level of effort.			
Title: MGUE Increment 2 (Inc2) with Precision Guidance Kit - Anti Jam (LR PGK) ***Description:*** Influence next generation Military GPS User Equipment (MGUE) development to ensure precision guided munition needs and requirements are met with the Air Force's next generation MGUE. Integrate and test next generation MGUE into the Long Range Precision Guidance Kit (LR-PGK) as the DoD-selected representative Joint precision munition to verify and validate needs and requirements are met by next generation MGUE. ***FY 2020 Plans:*** Finalized next generation Precision Guided Munition (PGM) Military GPS User Equipment (MGUE) technical requirements document for use by the MGUE program. Attended technical interchange meetings with MGUE vendors to influence MGUE designs to meet Precision Guided Munitions (PGM) needs and requirements for next generation performance. Performed risk reduction analysis and activities of MGUE vendor designs. ***FY 2021 Plans:*** Perform modeling and simulations on GPS threat scenarios on MGUE designs to assess performance for PGM applications. Perform risk reduction analysis and activities of MGUE vendor designs. Draft Inc2 Next Generation Application Specific Integrated Circuit (ASIC) (NGA) Technology Maturity Assessment (TMA) & Integration Risk Analysis (IRA) Report for PGMs. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** GPS vendor designs will be more mature in FY 2021 and a more formalized technology maturity assessment and integration risk analysis will be needed to track progress and assess future integration risk. A formalized process in FY 2021 will require an additional level of effort beyond FY 2020.	-	1.023	1.500
Title: Fires System-of-Systems APNT related AS and Navigation Warfare (NavWar) ***Description:*** Prototype PNT enabling technologies that are critical for executing Fires System-of-Systems NavWar missions to include munition-based offensive, defensive, and associated command and control (C2) functions. Prototyping efforts will focus on enabling combat lethality overmatch in PNT challenged environments for cannon and rocket/missile core missions. Provide long	-	-	3.786

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
range stand-off NavWar capability to penetrate contested Anti Access/Area Denial (A2/AD) environments via use of long-range artillery, Fires systems-of-systems architectures enabling advanced NavWar attack, sense, and optimization, and advanced anti-jam/anti-spoof techniques for munitions. ***FY 2021 Plans:*** Prototype PNT enabling technologies that are critical to APNT and AS operational capabilities within the fires system-of-systems domain. Prototyping efforts will focus on enabling and or maintaining combat lethality overmatch in PNT challenged environments for cannon and rocket/missile applications. Design and develop a gun-hardened NavWar system prototype that can be demonstrated in a Live Fire Test from a 155mm artillery cargo round to prove its capability in FY 2022. Technical reports informing emerging gun-launched NavWar CONOPs and capability requirements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 focuses on prototyping PNT technologies to fill Precision Weapons and Munitions NavWar gaps via enhancing fires system-of-systems APNT and Anti-Spoof operational capabilities and enabling munition-deployed NavWar payloads. This effort will take two years & utilizes previous system-of-systems efforts to further refine and develop PNT and NavWar enabling technologies.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.419	-
Accomplishments/Planned Programs Subtotals	13.797	31.267	29.878

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition Strategy: The Assured Precision Weapons and Munitions Project will utilize a combination of Other Transaction Authority (OTA) contract mechanisms such as the Defense Ordinance Technology Consortium (DOTC) Section 845 OTA and In-House government development and engineering capabilities to obtain

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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prototypes and demonstrate/evaluate the maturity and integration risk of the M-Code GPS on Precision Munitions and Weapons, as well as other alternative PNT related capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.419		-		-		-	0.000	1.419	-
		Subtotal	-	-		1.419		-		-		-	0.000	1.419	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PGM MGUE AS Risk Reduction	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD,Various : Various	7.785	-		-		-		-		-	0.000	7.785	-
Assured PNT related Weapons Integration Risk Mitigation	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD,Various : Various	3.265	3.585	Dec 2018	4.324	Dec 2019	4.400	Dec 2020	-		4.400	Continuing	Continuing	Continuing
Assured PNT related Weapons Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	2.000	2.000	Dec 2018	1.271	Dec 2019	1.000	Dec 2020	-		1.000	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Risk Mitigation	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD,Various : Various	2.500	2.500	Dec 2018	4.571	Dec 2019	2.786	Dec 2020	-		2.786	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD,Various : Various	2.000	2.000	Dec 2018	4.611	Dec 2019	3.175	Dec 2020	-		3.175	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army M-Code Technology Integration and Evaluation	MIPR	Various : Various	-	-		6.521	Dec 2019	7.101	Dec 2020	-		7.101	Continuing	Continuing	Continuing
		Subtotal	17.550	10.085		21.298		18.462		-		18.462	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Joint Program Executive Office Armaments and Ammunition (JPEO A&A) : Picatinny Arsenal, NJ	1.013	1.169	Dec 2018	1.140	Dec 2019	1.275	Dec 2020	-		1.275	Continuing	Continuing	Continuing
Assured Precision Weapons and Munitions IPT Support	MIPR	Various : Various	2.861	1.086	Dec 2018	2.176	Dec 2019	2.341	Dec 2020	-		2.341	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Combat Capability Development Command Armament Center (CCDC AC) : Picatinny Arsenal, NJ	0.835	0.657	Dec 2018	1.071	Dec 2019	1.100	Dec 2020	-		1.100	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Communication Electronics Research,Development and Engineering Center (C5ISR) : Aberdeen Proving Ground, MD	-	0.800	Dec 2018	0.671	Dec 2019	0.200	Dec 2020	-		0.200	Continuing	Continuing	Continuing
Army M-Code Technology Integration and Evaluation Support	MIPR	Various : Various	-	-		2.421	Dec 2019	3.500	Dec 2020	-		3.500	Continuing	Continuing	Continuing
MGUE Inc 2 for LR-PGK Engineering Support	MIPR	Combat Capability Development	-	-		1.071	Dec 2019	1.500	Dec 2020	-		1.500	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Command Armament Center (CCDC AC) : Picatinny Arsenal, NJ													
Army M-Code Technology Integration & Evaluation Support (Multiple PEOs)	MIPR	Various : Various	-	-		-		1.500	Dec 2020	-		1.500	Continuing	Continuing	Continuing
		Subtotal	4.709	3.712		8.550		11.416		-		11.416	Continuing	Continuing	N/A

Remarks

Support consists of labor, travel and other non-labor costs in Fiscal Year (FY) 2021.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	22.259	13.797		31.267		29.878		-		29.878	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
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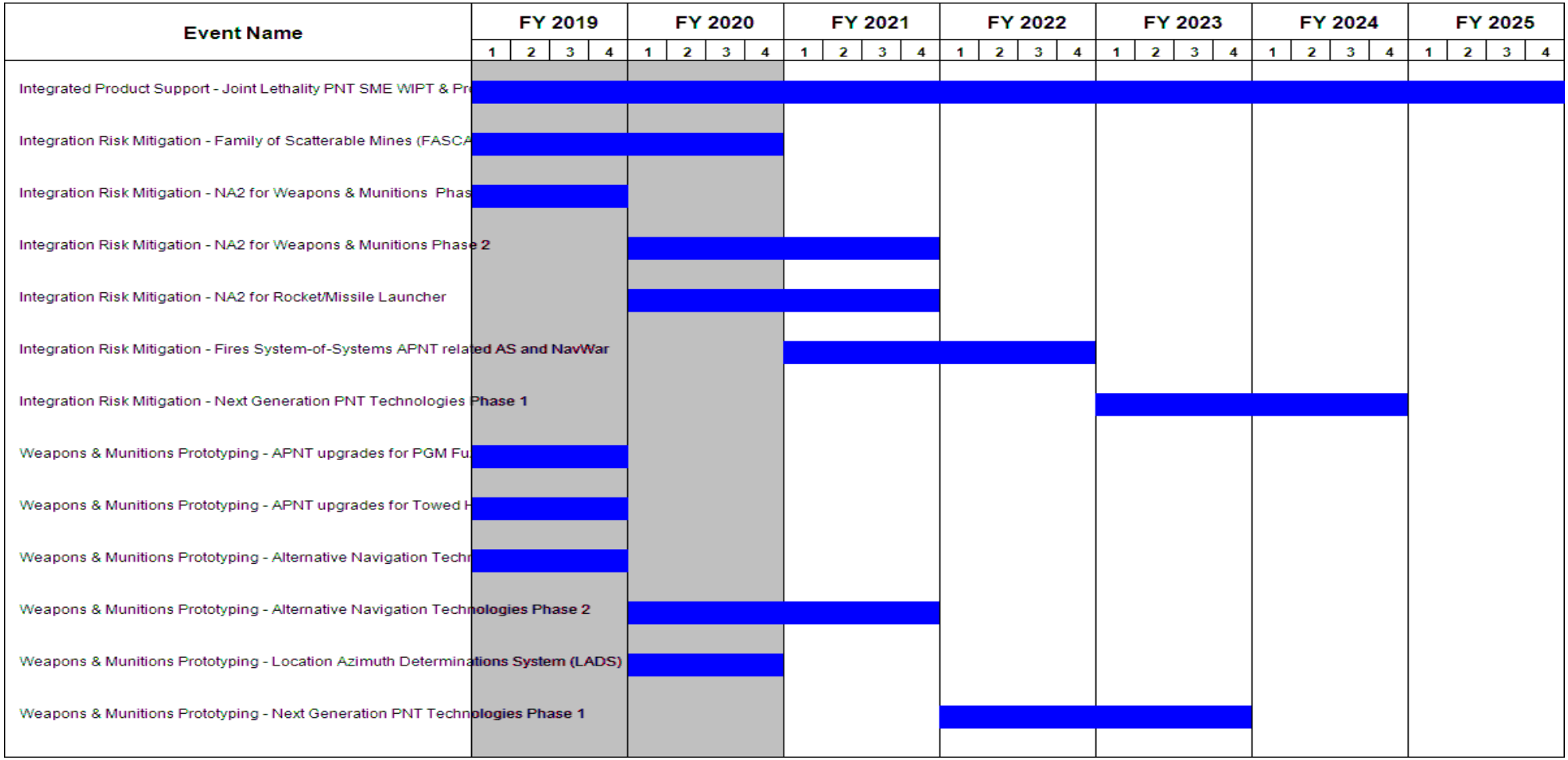

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FA5 / *Assured Precision Weapons and Munitions*

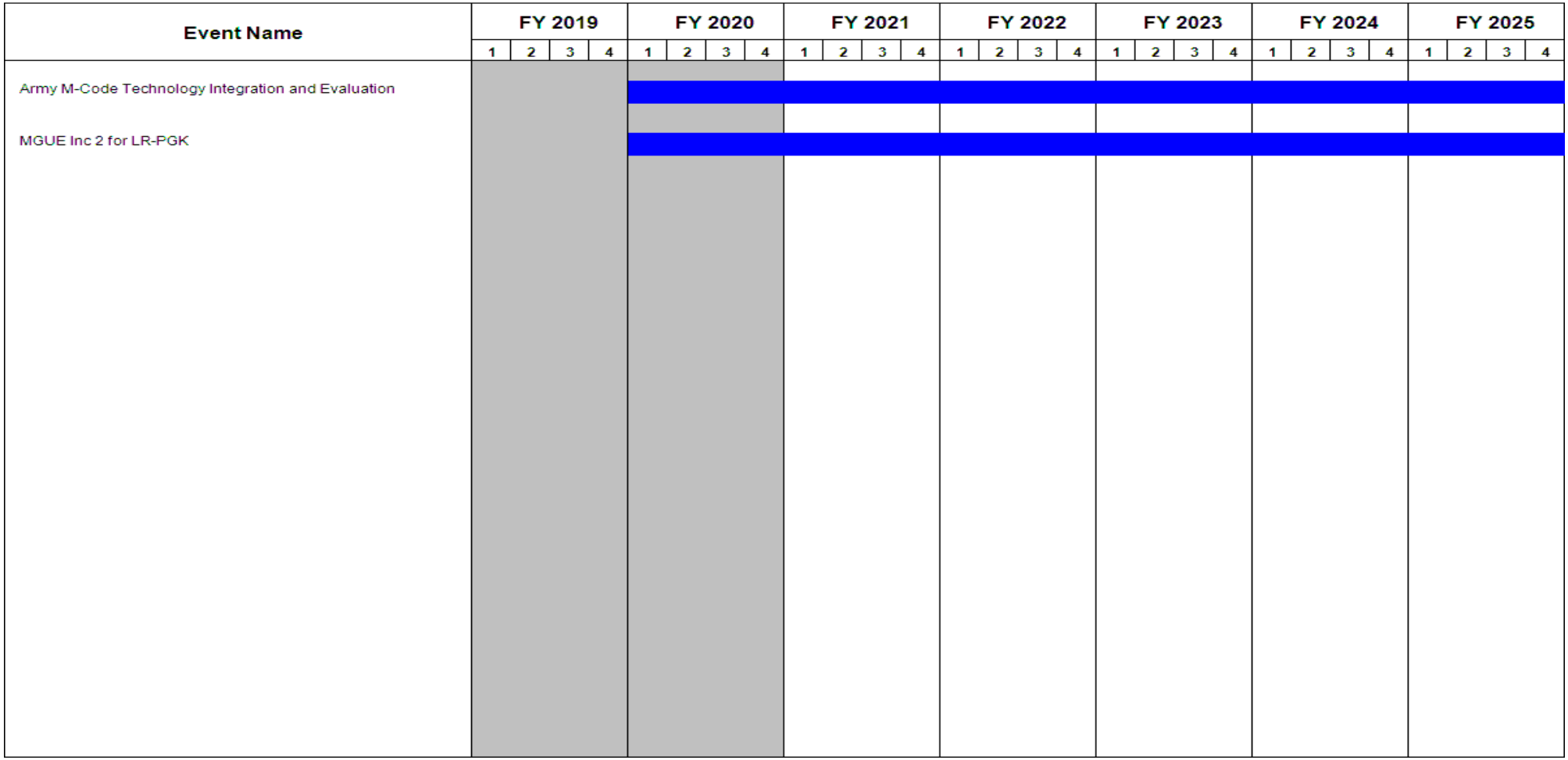

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
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Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Integrated Product Support - Joint Lethality PNT SME WIPT & Program Management	1	2017	4	2028
Integration Risk Mitigation - Implement Zero-Age-of-Data (ZAOD)	1	2018	4	2018
Integration Risk Mitigation - Family of Scatterable Mines (FASCAM) Replacement	1	2019	4	2020
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 1	1	2018	4	2019
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 2	1	2020	4	2021
Integration Risk Mitigation - NA2 for Rocket/Missile Launcher	1	2020	4	2021
Integration Risk Mitigation - Fires System-of-Systems APNT related AS and NavWar	1	2021	4	2022
Integration Risk Mitigation - Next Generation PNT Technologies Phase 1	1	2023	4	2024
Weapons & Munitions Prototyping - APNT upgrades for PGM Fuze Setter	1	2018	4	2019
Weapons & Munitions Prototyping - APNT upgrades for Towed Howitzer Platforms	1	2018	4	2019
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 1	1	2018	4	2019
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 2	1	2020	4	2021
Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)	1	2020	4	2020
Weapons & Munitions Prototyping - Next Generation PNT Technologies Phase 1	1	2022	4	2023
Army M-Code Technology Integration and Evaluation	1	2020	4	2028
MGUE Inc 2 for LR-PGK	1	2020	4	2027

Note

Notes:
Positioning, Navigation and Timing (PNT)
Subject Matter Expert (SME)
Working Integrated Product Team (WIPT)
Network Assisted (NA)
Assured Positioning, Navigation and Timing (APNT)

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
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COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FG1: *Cannon-Delivered Area Effects Munitions (C-DAEM)*	-	5.713	21.447	40.961	-	40.961	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Cannon-Delivered Area Effects Munitions (C-DAEM) Project will provide United States (U.S). ground forces with the capability to engage area personnel through armored targets, while denying threat forces full operational freedom within the targeted area. An Analysis of Alternatives (AoA) was completed in January 2018 to inform Army acquisition and investment decisions regarding replacement of the current stockpile of 155 millimeter (mm) Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense (DoD) policy compliant munitions and address anti-armor and extended range capability requirements. The Army validated two materiel solutions for C-DAEM to be pursued in parallel. C-DAEM Armor (Increment 1) will destroy moved and moving infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM DPICM Replacement (Increment 2) will destroy personnel to light-skinned vehicles. Fiscal Year (FY) 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase, which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: C-DAEM Armor	5.463	20.473	40.961
Description: C-DAEM Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. ***FY 2020 Plans:*** FY 2020 funding supported a competitive demonstration phase to identify the most promising candidate(s) that address medium to heavy armored targets. ***FY 2021 Plans:*** FY 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding from FY 2020 to FY 2021 to support C-DAEM Armor prototyping hardware and continued risk reduction efforts in support of the competitive demonstration phase.			
Title: C-DAEM DPICM Replacement	0.250	-	-
Description: C-DAEM DPICM Replacement will destroy personnel to light-skinned vehicles.			
Title: FY 2020 SBIR/STTR Transfer	-	0.974	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	5.713	21.447	40.961

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• FJ4: *Cannon-Delivered Area Effects Munitions (C-DAEM)*	-	-	27.600	-	27.600	82.685	72.655	64.440	54.453	0.000	301.833
• E68603: *PROJ, ARTY, 155MM C-DAEM INCREMENT 1*	-	-	0.000	-	0.000	-	72.129	108.593	226.773	0.000	407.495

Remarks

In FY 2021, Project FG1 supports C-DAEM Armor efforts. C-DAEM Armor will transition to Budget Activity 05 PE 0604802A Weapons and Munitions - Eng Dev Project FJ4, Cannon-Delivered Area Effects Munitions (C-DAEM), in FY 2022. In FY 2023, C-DAEM Armor will transition to production. A Procurement of Ammunition, Army (PAA) funding line, Standard Study Number (SSN) E68603, PROJ, ARTY, 155MM C-DAEM INCREMENT 1, is established for this effort.

In FY 2021, the C-DAEM DPICM Replacement effort will transition to BA 05 PE 0604802A Weapons and Munitions - Eng Dev Project FJ4, Cannon-Delivered Area Effects Munitions (C-DAEM). A PAA funding line for C-DAEM DPICM Replacement, SSN E68604, PROJ, ARTY, 155MM C-DAEM INCREMENT 2, will be established in FY 2024 for this effort.

D. Acquisition Strategy

C-DAEM will employ an evolutionary acquisition approach to efficiently transition the unique ammunition products as they become available. The AoA completed on 31 January 2018 qualified a dramatic enhancement of operational Fires effectiveness, efficiency, and maneuver support when cannon artillery was equipped with a dedicated extended range, anti-armor projectile. The U.S. Government is currently reducing risk by executing prototype testing and evaluation efforts in parallel to decompose the AoA results into selection criteria. C-DAEM will use the selection criteria to sponsor a competitive demonstration for C-DAEM Armor to streamline the acquisition process by leveraging Section 815 of the FY 2016 National Defense Authorization Act (NDAA). C-DAEM will use the Defense Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) to further support the completion of the C-DAEM Armor competitive demonstration phase, in FY 2021, which will inform the Army's cluster munition replacement strategy. Upon completion of the competitive demonstration phase, C-DAEM will proceed to qualification testing of the most promising candidate(s) in accordance with the decisions granted at the Army Requirements Oversight Council (AROC), in April 2018.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	0.410	0.950	Nov 2018	1.740	Nov 2019	0.950	Oct 2020	-		0.950	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.974		-		-		-	0.000	0.974	-
		Subtotal	0.410	0.950		2.714		0.950		-		0.950	Continuing	Continuing	N/A

Remarks

Program Management includes C-DAEM travel and milestone documentation support.

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Armor TMRR Phase	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	3.753		15.276	Apr 2020	22.100	Dec 2020	-		22.100	Continuing	Continuing	Continuing
		Subtotal	-	3.753		15.276		22.100		-		22.100	Continuing	Continuing	N/A

Remarks

Additional funding required in Fiscal Year (FY) 2021 for the completion C-DAEM Armor competitive demonstration efforts.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Armor Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center	0.550	0.760	Nov 2018	2.847	Nov 2019	3.011	Oct 2020	-		3.011	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		(CCDC AC) : Picatinny Arsenal, NJ													
Armor Engineering Support	MIPR	Combat Capabilities Development Command Data Analysis Center (CCDC DAC) : Aberdeen, MD	-	-		0.055	Jan 2020	-		-		-	0.000	0.055	-
Armor Engineering Support	MIPR	Combat Capabilities Development Command Army Research Lab (CCDC ARL) : Aberdeen, MD	-	-		-		2.400	Oct 2020	-		2.400	Continuing	Continuing	Continuing
DPICM Replacement Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny Arsenal, NJ	-	0.250	Nov 2018	-		-		-		-	0.000	0.250	-
		Subtotal	0.550	1.010		2.902		5.411		-		5.411	Continuing	Continuing	N/A

Remarks

Additional Engineering Support required in FY 2021 in support of C-DAEM Armor competitive demonstration efforts.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Armor Test Targets	MIPR	Targets Management Office : Redstone, AL	-	-		0.555	Jan 2020	10.000	Jan 2021	-		10.000	0.000	10.555	-
Armor Testing	MIPR	Army Test & Evaluation	-	-		-		2.500	Apr 2021	-		2.500	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Command (ATEC) : Yuma, AZ													
		Subtotal	-	-		0.555		12.500		-		12.500	Continuing	Continuing	N/A

Remarks

C-DAEM is on Operational and Live Fire Test & Evaluation Oversight.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.960	5.713		21.447		40.961		-		40.961	Continuing	Continuing	N/A

Remarks

Cannon-Delivered Area Effects Munitions (C-DAEM) Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM Dual Purposed Improved Conventional Munitions (DPICM) Replacement will destroy personnel to light-skinned vehicles.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*

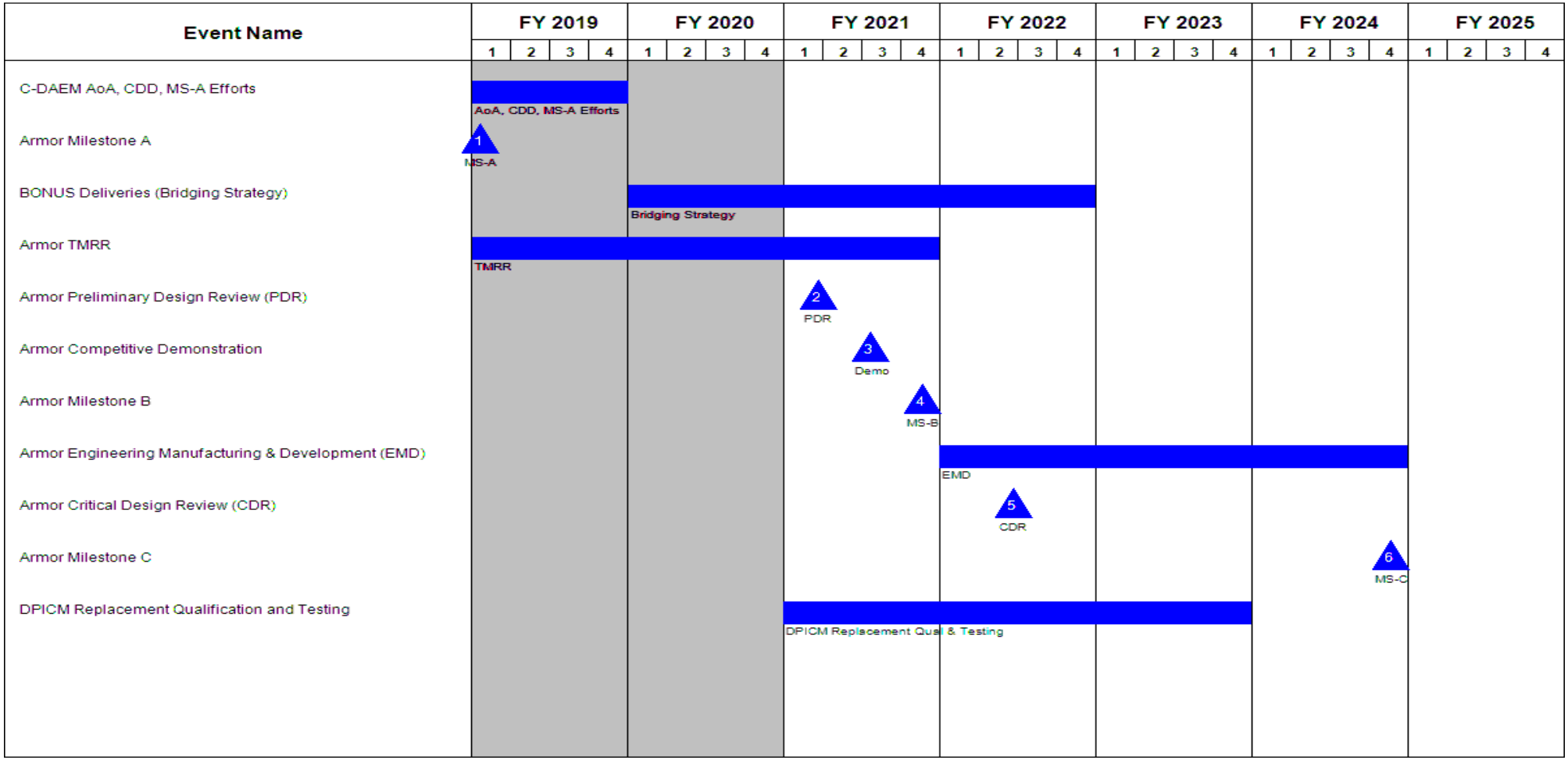

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** FG1 / *Cannon-Delivered Area Effects Munitions (C-DAEM)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
C-DAEM AoA, CDD, MS-A Efforts	1	2018	4	2019
Armor Milestone A	1	2019	1	2019
BONUS Deliveries (Bridging Strategy)	1	2020	4	2022
Armor TMRR	1	2019	4	2021
Armor Preliminary Design Review (PDR)	1	2021	1	2021
Armor Competitive Demonstration	3	2021	3	2021
Armor Milestone B	4	2021	4	2021
Armor Engineering Manufacturing & Development (EMD)	1	2022	4	2024
Armor Critical Design Review (CDR)	2	2022	2	2022
Armor Milestone C	4	2024	4	2024
DPICM Replacement Qualification and Testing	1	2021	4	2023

Note

Cannon-Delivered Area Effects Munitions (C-DAEM) Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM Dual Purposed Improved Conventional Munitions (DPICM) Replacement will destroy personnel to light-skinned vehicles. C-DAEM Armor and DPICM Replacement are being developed simultaneously.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) XT5 / *30mm Anti-Personnel and Counter UAS*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
XT5: *30mm Anti-Personnel and Counter UAS*	-	3.730	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.730
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Lightweight 30x113 millimeter (mm) (LW30) Airburst is a new capability identified as a Warfighter requirement in the Capability Production Document (CPD), AH-64E Helicopter, Increment 1, Version 6. The LW30 airburst cartridge improves the ability of the warfighter to effectively engage anti-personnel/materiel targets due to increased lethality. Airburst capability provides the user with a much higher probability of achieving a first burst kill against enemy personnel targets in the open. The LW30 will retain its dual purpose warhead, allowing it to continue to defeat light armored threats through point detonation. The cartridge provides increased lethal effects against personnel and soft-skin vehicular targets increasing Soldier Survivability on the ground during troops in contact engagements and decreases the required number of rounds to reach the desired lethal effects. There is no funding requested in Fiscal Year (FY) 2021.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR) ***Description:*** Demonstrating Technology Readiness Level 6 and achieving pre-Milestone (MS) B approval.	3.730	-	-
Accomplishments/Planned Programs Subtotals	3.730	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The development of the Lightweight 30mm (LW30, 30mmx113mm) Airburst cartridge during the Technology Maturation and Risk Reduction (TMRR) phase was awarded through an Other Transaction Authority (OTA). The TMRR effort will consist of critical technology prototyping, testing, and demonstrating in the relevant environment that will conclude with a TRL 6 demonstration.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / *Tank and Medium Caliber Ammunition*	Project (Number/Name) XT5 / *30mm Anti-Personnel and Counter UAS*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
30mm Prototype Design	C/CPFF	General Dynamics : Marion, IL	2.475	-		-		-		-		-	0.000	2.475	-
30mm Prototype Design	C/CPFF	Northrop Grumman Information Systems (NGIS) : Plymouth, Mn	-	3.305	Dec 2019	-		-		-		-	0.000	3.305	-
		Subtotal	2.475	3.305		-		-		-		-	0.000	5.780	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	-	0.425	Jul 2019	-		-		-		-	0.000	0.425	-
		Subtotal	-	0.425		-		-		-		-	0.000	0.425	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.475	3.730		0.000		-		-		-	0.000	6.205	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** XT5 / *30mm Anti-Personnel and Counter UAS*

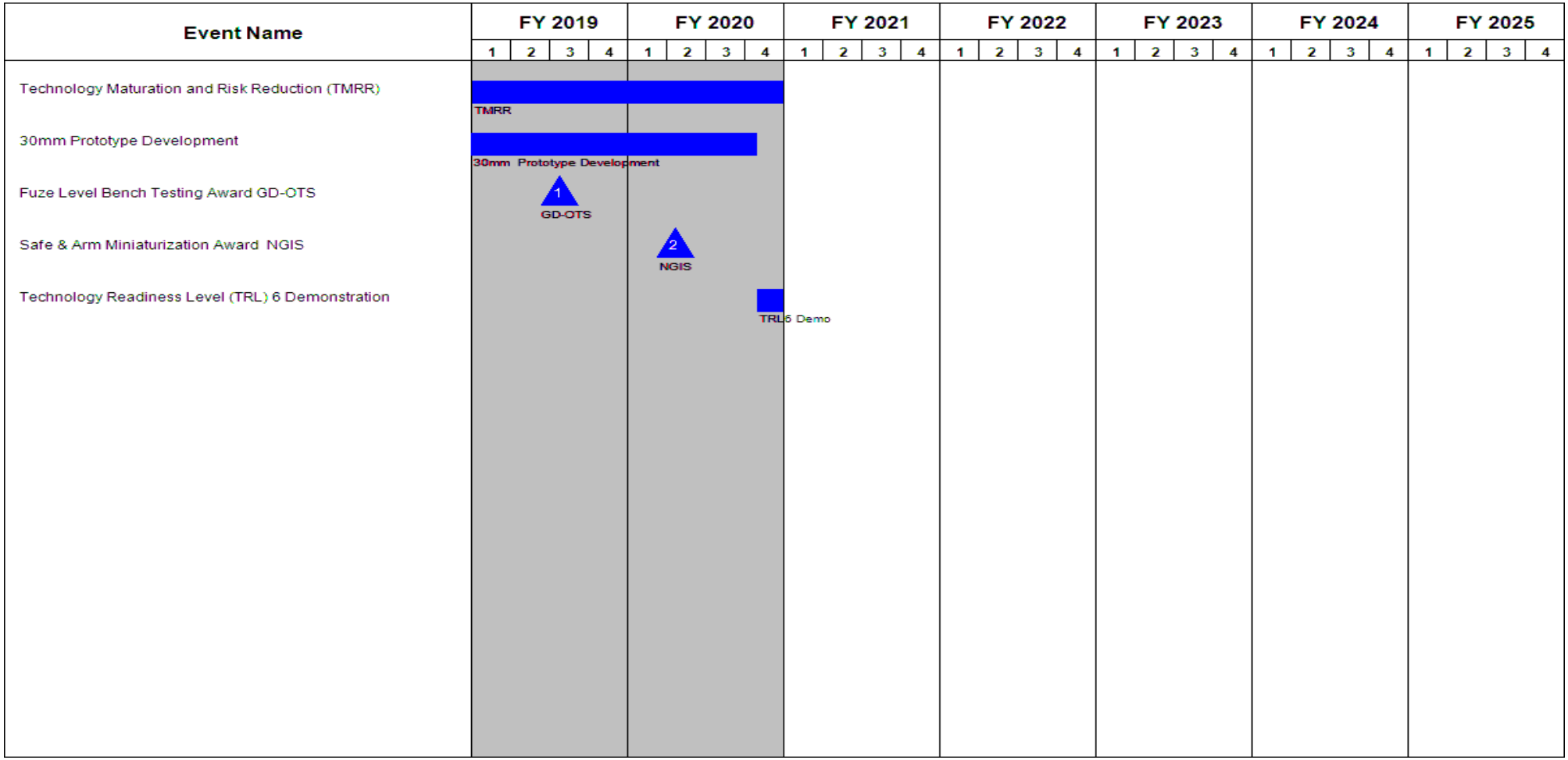

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603639A / *Tank and Medium Caliber Ammunition*	**Project (Number/Name)** XT5 / *30mm Anti-Personnel and Counter UAS*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Technology Maturation and Risk Reduction (TMRR)	1	2018	4	2020
30mm Prototype Development	4	2018	4	2020
Fuze Level Bench Testing Award GD-OTS	3	2019	3	2019
Safe & Arm Miniaturization Award NGIS	2	2020	2	2020
Technology Readiness Level (TRL) 6 Demonstration	4	2020	4	2020

Note

Note:
General Dynamics Ordinance and Tactical Systems (GD-OTS)
Northrop Grumman Information Systems (NGIS)

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603645A *I Armored System Modernization - Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	80.106	144.234	151.478	-	151.478	172.700	50.656	44.658	24.979	0.000	668.811
EV7: *Combat Vehicle Prototyping*	-	80.106	144.234	151.478	-	151.478	172.700	50.656	44.658	24.979	0.000	668.811

A. Mission Description and Budget Item Justification

Armored System Modernization provides focused investment for the technology development of combat vehicles for future battlefields. The purpose of this Program Element's (PE) funding is to integrate the next generation of technology enabled capabilities developed in the Science and Technology (S&T) portfolio and Industry to demonstrate new capabilities to meet emerging military needs, provide hardware for Soldier operational experiment/feedback, and determine integration potential across the current Army portfolio of ground vehicles. The primary efforts include but not limited to, maturing and experimenting with Manned Un-Manned Teaming, in conjunction with the Robotic Combat Vehicle, maturing, integrating and experimenting with a variety of technologies for the Optionally Manned Fighting Vehicle (OMFV), and other legacy combat vehicles/platforms within the Maneuver portfolio.

Armored System Modernization allows for aggressive innovation that could provide a bridge from S&T investment to vehicle integration and operational use. It can inform requirements through User Evaluations, mitigate capability gaps and reduce integration risks. The strategy will be to focus on delivering incremental experimental prototypes to the warfighter to demonstrate Manned Un-Manned Teaming (MUM-T), to integrate technologies to maintain overmatch while demonstrating crew task reductions through crew augmentation enabled by optimized Warfighter Machine Interface (WMI) and sensor fusion. The funding will support virtual and physical concept development, trade studies, technical and operational analyses to assess future concepts and designs. This effort will partner government organic capabilities and Industry for an iterative process to develop combat vehicle concepts and prototypes in order to inform and stabilize future capability requirements, performance characteristics, and affordability, evaluate and update operational concepts, and reduce future acquisition risk. This would also include the support for survivability and lethality requirements/qualifications. In addition, this funding will support program management, system integration labs, technology maturation, integration risk reduction, qualification of key lethality/weapon system and sensor technologies to support current and future increments of the Optionally Manned Fighting Vehicle (OMFV), and other legacy combat vehicles/platforms within the Maneuver portfolio.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603645A / *Armored System Modernization - Adv Dev*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	84.297	157.656	151.624	-	151.624
Current President's Budget	80.106	144.234	151.478	-	151.478
Total Adjustments	-4.191	-13.422	-0.146	-	-0.146
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-13.422			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-4.191	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.146	-	-0.146

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / *Armored System Modernization - Adv Dev*	Project (Number/Name) EV7 / *Combat Vehicle Prototyping*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EV7: *Combat Vehicle Prototyping*	-	80.106	144.234	151.478	-	151.478	172.700	50.656	44.658	24.979	0.000	668.811
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Next Generation Combat Vehicle Cross Functional Team (NGCV CFT).

A. Mission Description and Budget Item Justification

Armored System Modernization provides focused investment for the technology development of combat vehicles for future battlefields. The purpose of this Program Element's (PE) funding is to integrate the next generation of technology enabled capabilities developed in the Science and Technology (S&T) portfolio and Industry to demonstrate new capabilities to meet emerging military needs, provide hardware for Soldier operational experiment/feedback, and determine integration potential across the current Army portfolio of ground vehicles. The primary efforts include but not limited to, maturing and experimenting with Manned Un-Manned Teaming, in conjunction with the Robotic Combat Vehicle, maturing, integrating and experimenting with a variety of technologies for the Optionally Manned Fighting Vehicle (OMFV), and other legacy combat vehicles/platforms within the Maneuver portfolio.

Armored System Modernization allows for aggressive innovation that could provide a bridge from S&T investment to vehicle integration and operational use. It can inform requirements through User Evaluations, mitigate capability gaps and reduce integration risks. The strategy will be to focus on delivering incremental experimental prototypes to the warfighter to demonstrate Manned Un-Manned Teaming (MUM-T), to integrate technologies to maintain overmatch while demonstrating crew task reductions through crew augmentation enabled by optimized Warfighter Machine Interface (WMI) and sensor fusion. The funding will support virtual and physical concept development, trade studies, technical and operational analyses to assess future concepts and designs. This would also include the support for survivability and lethality requirements/qualifications. In addition, this funding will support program management, system integration labs, technology maturation, integration risk reduction, qualification of key lethality/weapon system and sensor technologies to support current and future increments of the Optionally Manned Fighting Vehicle (OMFV), and other legacy combat vehicles/platforms within the Maneuver portfolio.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Government Engineering & Program Management	18.694	8.240	15.162
Description: This effort will support Government program management that will cover the costs of government and direct support contractor labor, travel, training, supplies, equipment and facilities to manage the experimental prototyping program as well as the Program Management Office (PMO).			
FY 2020 Plans: The funding supported Government program management that covered the costs of government and direct support contractor labor, travel, training, supplies, equipment and facilities to manage the experimental prototyping program as well as the Program			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Management Office (PMO). This also continued management of Mission Enabled Technology - Demonstrator (MET-D) Phase I cost and schedule during the Performance Test and Soldier Experiment; MET-D Phase II cost, schedule and performance as the project transitioned from the design to build phase and prepared for the test phase; and begun management of MET-D Phase II cost, schedule and performance during the design phase to enable long lead procurement. This funding also supported the PMOs and Combat Capabilities Development Command (CCDC) as needed for labor, travel, and equipment. ***FY 2021 Plans:*** This funding will support Government program management that will cover the costs of government and direct support contractor labor, travel, training, supplies, equipment and facilities to manage the experimental prototyping program as well as the Program Management Office (PMO). This funding will be allocated for MET-D Phase II and III, Combat Capabilities Development Command (CCDC) Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, and Reconnaissance (C5ISR) Phase II & Phase III technology maturation, CCDC Armaments center technology qualification, and other program management support offices. It will fund the management of the experimental prototyping program, continued technology maturation, and software and data architecture. This effort will include management of MET-D Phase II during Shakedown testing, Army Test and Evaluation Command (ATEC) Safety Evaluation, and the Soldier Operational Experiment and MET-D Phase III cost and schedule as the project progresses through the design phase and into the build phase. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Government Engineering and Program Management will increase due to the simultaneous phases of MET-D, CCDC C5ISR, CCDC Armaments Center & other program management support.			
Title: Test & Evaluation ***Description:*** Test and Evaluation activities includes contractor and government testing as well as test documentation development. Contractor prove-out testing will be conducted using United States Army test facilities. Government development testing of prototype vehicles and technologies will evaluate vehicle performance and include user evaluation. ***FY 2020 Plans:*** The funding conducted MET-D Phase I performance and user evaluation; gathered and analyzed all data; and developed and delivered final test report. This furthered the development and refinement of the MET-D Phase II Test and Evaluation Master Plan (TEMP) and test procedures to support Phase II integration, safety, and demonstration testing set to begin in Fiscal Year (FY) 2021. ***FY 2021 Plans:*** The T&E funding will prepare, coordinate, and conduct test and evaluation activities with ATEC for MET-D Phase II Safety Testing to include MET-D Phase II Company-Level Soldier Operational Experiment (SOE). This funding will further develop the MET-D Phase III TEMP and test procedures to support Phase III integration, safety, and demonstration testing. C5ISR will conduct	8.000	1.170	13.364

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
comprehensive and enhanced fabrication, integration, analyst and test and evaluation events along with CCDC conducting qualification testing for survivability and lethality requirements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Test & Evaluation has increased in FY 2021 due to the execution of MET-D Phase II Shakedown, ATEC Safety testing and a company-level SOE of 6 MET-D vehicles. The increase also includes additional testing maturation of technologies and software.			
Title: Modeling & Simulation ***Description:*** The modeling and simulation effort is to assess operational needs and operational employment by using the Maneuver Battle lab at Fort Benning and One Semi-Automated Forces (OneSAF) modeling. The results will provide the analytical underpinnings to support development of requirements. Modeling and simulation efforts will produce the ability to experiment in a virtual environment to conduct data collection. ***FY 2020 Plans:*** This funding refined models utilized across ground vehicle platforms based on MET-D Phase I test results. Models then were updated with technologies identified for MET-D Phase II integration to conduct analysis prior to integration informing performance characteristics and identifying potential integration challenges. Analysis conducted for performance and operational analysis concepts were to inform and stabilize capability requirements, performance characteristics, and operational concepts to reduce future acquisition risk. ***FY 2021 Plans:*** The continued modeling and simulation efforts will produce the ability to experiment in a virtual environment to conduct data collection and results that will inform the physical testing desires of the Soldier Operational Experiments (SOE).The update of models from MET-D Phase II technologies are identified for integration into Phase III will be used to conduct analysis prior to integration in order to inform performance characteristics and identify potential integration challenges. Soldier virtual experiments will be conducted with Phase III technology configuration in conjunction with the Robotic Combat Vehicle (RCV) to determine any Manned Un-Manned Teaming (MUM-T) areas of concern that should be addressed prior to execution of the Phase III SOE. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Modeling & Simulation has increased in FY 2021 due to further maturation of the virtual and physical concept development of the MET-D Phase III and the OMT.	1.834	3.050	7.407
Title: Experimental Prototyping ***Description:*** This effort will accelerate prototyping and technology maturation, both organic and from Industry, for combat vehicles and internal fusion of data from different sensors and how it will be displayed and used by manned and autonomous systems. Experimental prototyping allows for aggressive innovation through integration of next generation technologies developed	51.578	124.534	46.972

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021

in the S&T portfolio and public/private partnerships. This includes the development of the XM-913 and the development of ammunition needed for lethality improvements. Experimentation will help to inform requirements for the OMFV and other legacy platforms and how they will operate, mitigate capability gaps, and reduce technology maturation and integration risks. The experimentation will also provide improved capabilities for command and control of the RCV.

FY 2020 Plans:

This funding delivered the second phase of MET-D experimental prototypes in FY 2021. The MET-D Phase II efforts continued system level prototype development and integration; maintained system level software; and developed software stability upgrades based on results from the MET-D Phase I Experimentation. The platform software upgrades supported integration of advanced technologies, improved Warfighter Machine Interface (WMI), and improvements for RCV command and control. Based on feedback from the Phase I Experiment, MET-D Phase II also updated the software system integration laboratory (SIL), crew station SIL, and software test benches in order to simulate integrated system functionality prior to physical integration for Phase II. The MET-D Phase II effort begun to build prototypes with increased capability provided from the next increment of S&T technological deliverables. The effort begun with the purchase of long lead materials and technologies, design of the Phase II prototype upgrades for integration of the technologies, and system software updates. The effort continued the refinement and maturation of foundational architectures and technologies for power and mobility, lethality, protection, and situational awareness. The effort conducted the developmental engineering effort for maturation and integration of technologies such as indirect driver's vision and situational awareness technologies, sensors, crew interfaces and autonomous systems for crew augmentation, lethality solutions, high voltage power architecture, data architecture, communications, active and adaptive protection solutions and payloads.

FY 2021 Plans:

This funding will deliver the third phase of MET-D experimental prototypes in FY 2023. The MET-D Phase III efforts will continue system level prototype development and integration; maintain existing system level software; and develop software upgrades based on results from the MET-D Phase II Experimentation. The system software upgrades will support integration of advanced technologies, improved WMI, improvements for MUM-T, additional autonomous behaviors, improvements in electrical power and network architecture, advancements in slip ring technologies, and enhancements to CCDC C5ISR technologies. This funding will also support the development of technologies to include but not limited to; unmanned turret, UAS/UGS target feed, 3D printing, suspension/track, Pre Shot/Laser warning, Aided Target Recognition, MAPS, 50mm MCAS, and hybrid electric power, that will be integrated onto the OMFV and other legacy platforms/vehicles.

FY 2020 to FY 2021 Increase/Decrease Statement:

Experimental Prototyping will decrease in FY 2021 due to the completion of MET-D Phase I in FY 2020 resulting in the execution of prototyping costs for only two phases simultaneously (MET-D Phase II and III) rather than all three. In addition, the amount of

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
prototyping costs for Phase II has also decreased due to the execution of the SOE in FY 2021. Funding has also been broken out into Other support & technology costs.			
Title: Powertrain Maturation	-	0.690	4.000
Description: This effort will emphasize improving component engine and transmission subsystem maturity and reduce engine and transmission cost and manufacturing time. The Army will conduct maturation and demonstration activities to expedite technology transition from laboratory to operational use and prepare for low rate initial production of the advanced combat engine and transmission. This effort will conduct the evaluation of reliability, maintainability, and logistical analyses necessary to transition to a vehicle platform and conduct maturation to the components as a result of these evaluations. ***FY 2020 Plans:*** Advanced Combat Engine efforts developed and delivered in FY 2019 under the Advanced Powertrain Demonstrator Science and Technology project will be assessed for manufacturability of the design. Design improvements will be made to further improve integration of the components and reduce cost and manufacturing time of the components. In FY 2020, the focus was on the manufacturability of the design which included replacing expensive custom subcomponents against mass produced hardware. These efforts led to iterative engine prototypes that required performance testing to ensure they could achieve durability metrics while maintaining their performance capabilities. These were the initial assessments for the reliability, maintainability, and logistical analyses necessary to transition to a vehicle platform. ***FY 2021 Plans:*** Focus will be on the manufacturability of the design which includes replacing expensive custom subcomponents with mass produced hardware and improving the assembly process to use more automation and create less waste. These efforts will result in iterative engine and transmission prototypes that require performance and durability testing to ensure they can be integrated while maintaining their performance capabilities. These will be the foundation for the reliability, maintainability, and logistical analyses necessary to transition to a vehicle platform. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Powertrain Maturation funding has increased in FY 2021 due to the amount of funding necessary to prepare the contractor to be able to build the Advanced Combat Engine and Transmission.			
Title: Other support & technology costs	-	-	64.573
Description: This effort includes the MET-D Phase II advancements in technology, Phase III development with the development of the software SIL, CCDC C5ISR Phase II & Phase III technology maturation, and CCDC Armaments Center technology maturation and qualification, as well as supporting the XM-913 development/qualification and development of the ammunition. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Based on feedback from the MET-D Phase II Experiment and advancements in technology, MET-D Phase III will also develop and update software SIL, crew station training simulators, and software test benches in order to represent the new integrated system functionality prior to physical integration for Phase III. The efforts include but are not limited to, maturing and experimenting with Manned Un-Manned Teaming in conjunction with the Robotic Combat Vehicle, and maturing, integrating and experimenting with a variety of technologies for the OMFV and other legacy combat vehicles/platforms within the Maneuver portfolio in the SILs. This effort also includes the CCDC C5ISR Army mission command software maturation, architecture maturation, technical and operational analytical studies, and mission targeting support software and algorithms. The CCDC Armaments center will also conduct technology maturation and qualification of survivability and lethality requirements. The funding will support other efforts such as the development of the XM-913 development/qualification and the development of the ammunition. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in Other support & technology costs in FY 2021 is due to the breakout of costs within the Experimental Prototyping cost.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	6.550	-
Accomplishments/Planned Programs Subtotals	80.106	144.234	151.478

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This program provides the Optionally Manned Fighting Vehicle and other legacy combat vehicle platforms within the Maneuver portfolio the focused investment for the development and demonstration of technology and prototyping for future combat vehicles in the battlefield. The purpose of this funding is to integrate the next generation of technology enabled capabilities developed in the S&T portfolio to demonstrate new capabilities to meet emerging military needs, provide hardware for Soldier operational evaluation/feedback, to determine integration potential across the current Army portfolio of ground vehicles and to develop platform level prototypes.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		6.550		-		-		-	0.000	6.550	-
		Subtotal	-	-		6.550		-		-		-	0.000	6.550	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NGCV Contract(s)	C/Various	Various : Various	5.671	31.254	Mar 2019	44.583	Mar 2020	-		-		-	Continuing	Continuing	Continuing
Prototyping with Industry	C/Various	Various : Various	-	15.324	Jul 2019	79.079	Feb 2020	-		-		-	0.000	94.403	-
Sensor Fuse/Crew/SIL	SS/TIA	Various : Various	10.000	5.000	Jul 2019	-		-		-		-	0.000	15.000	-
Powerttrain Maturation	TBD	TBD : TBD	-	-		0.908	Jul 2020	4.000	Jul 2021	-		4.000	Continuing	Continuing	Continuing
Other support & technology costs	TBD	TBD : TBD	-	-		-		64.573	Jul 2021	-		64.573	Continuing	Continuing	Continuing
Experimental Prototyping (MET-D)	TBD	TBD : TBD	-	-		-		46.972	Jul 2021	-		46.972	Continuing	Continuing	Continuing
		Subtotal	15.671	51.578		124.570		115.545		-		115.545	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PMO/PEO Support	MIPR	PM/PEO : Warren, MI	13.546	18.694	Dec 2018	8.458	Jan 2020	15.162	Jan 2021	-		15.162	Continuing	Continuing	Continuing
		Subtotal	13.546	18.694		8.458		15.162		-		15.162	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Modeling & Simulation	MIPR	Various : Various	3.000	1.834	Mar 2019	3.268	Mar 2020	7.407		-		7.407	Continuing	Continuing	Continuing
Developmental testing	MIPR	Various : Various	-	8.000	Jul 2019	1.388	Jun 2020	13.364		-		13.364	0.000	22.752	-
		Subtotal	3.000	9.834		4.656		20.771		-		20.771	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.217	80.106		144.234		151.478		-		151.478	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

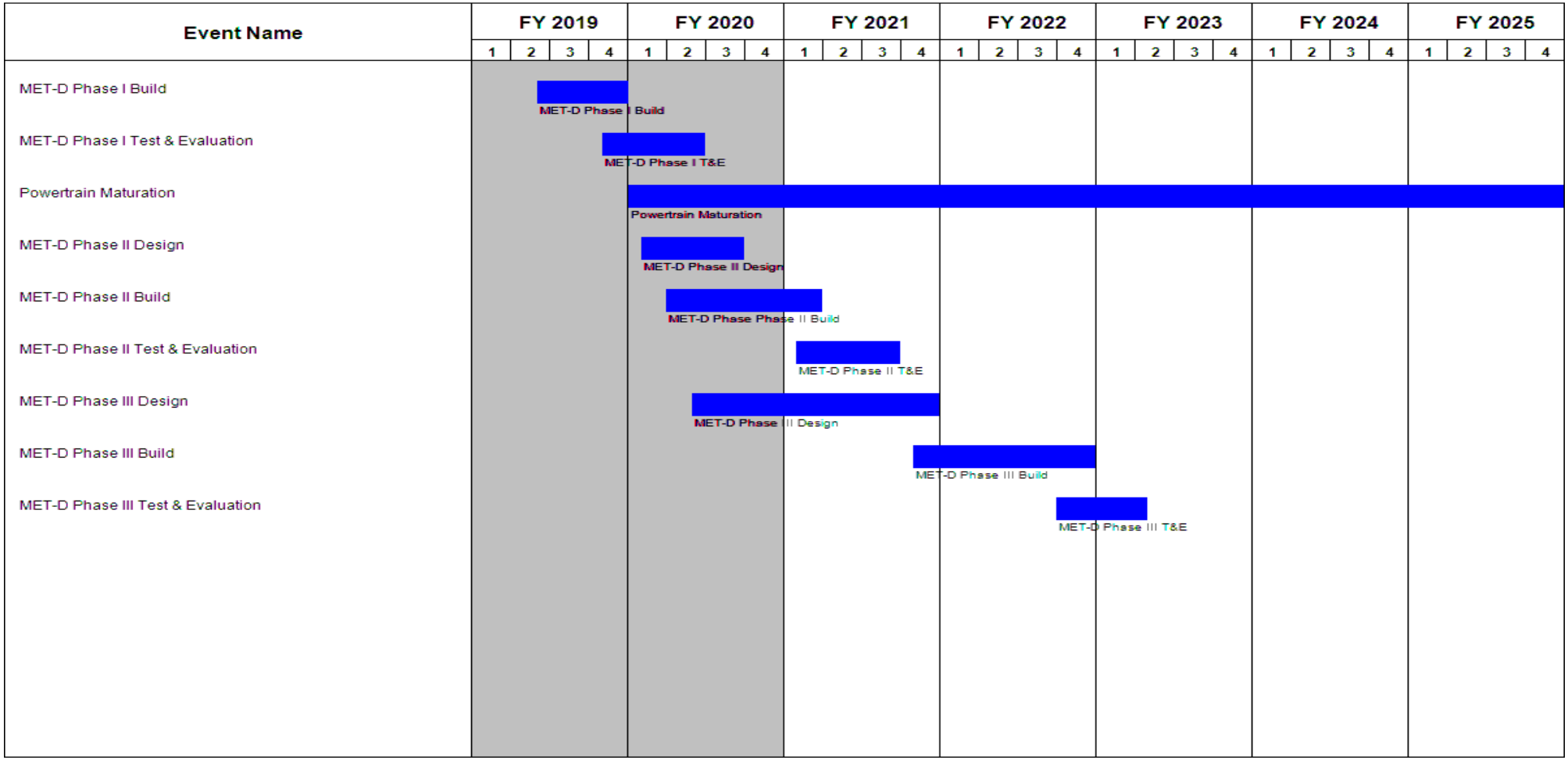

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603645A / *Armored System Modernization - Adv Dev*	**Project (Number/Name)** EV7 / *Combat Vehicle Prototyping*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
MET-D Phase I Build	2	2019	4	2019
MET-D Phase I Test & Evaluation	4	2019	2	2020
Powertrain Maturation	1	2020	4	2025
MET-D Phase II Design	1	2020	3	2020
MET-D Phase II Build	2	2020	1	2021
MET-D Phase II Test & Evaluation	1	2021	3	2021
MET-D Phase III Design	2	2020	4	2021
MET-D Phase III Build	4	2021	4	2022
MET-D Phase III Test & Evaluation	4	2022	2	2023

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	8.067	9.514	5.841	-	5.841	5.954	6.745	7.123	7.126	0.000	50.370
610: *Food Adv Development*	-	4.425	3.721	3.055	-	3.055	3.172	3.968	4.129	4.129	0.000	26.599
C08: *Rapid Equipping Force*	-	2.339	5.793	2.786	-	2.786	2.782	2.777	2.994	2.997	0.000	22.468
EL1: *Army Field Feeding Programs*	-	1.303	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.303

A. Mission Description and Budget Item Justification

This Program Element (PE) supports component development and prototyping for organizational equipment, improved individual clothing and equipment that enhance Soldier battlefield effectiveness, survivability, and sustainment. This PE also supports the component development and prototyping of joint service food and combat feeding equipment designed to reduce logistics burden.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	11.735	9.514	9.042	-	9.042
Current President's Budget	8.067	9.514	5.841	-	5.841
Total Adjustments	-3.668	0.000	-3.201	-	-3.201
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.668	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-3.201	-	-3.201

Change Summary Explanation

Decrease of $3.201M in FY 2021 due to reduction in REF anticipated ATEC testing and evaluation costs for project C08 Rapid Equipping Force.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) 610 / *Food Adv Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
610: *Food Adv Development*	-	4.425	3.721	3.055	-	3.055	3.172	3.968	4.129	4.129	0.000	26.599
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides for the advanced component development and prototyping of Joint Service combat ration components/platforms and field feeding equipment designed to improve warfighter performance and reduce the logistics burden of subsistence support. Efforts funded in this Project support all four Services, the Special Operations Command, and the Defense Logistics Agency. 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 as required by DoD Directive (DoDD) 3235.02E. Centralized execution of the DoD Combat Feeding Research and Engineering Program (CFREP) with Joint Service review and approval eliminates unnecessary duplication of efforts across the Services and maximizes use of common materiel solutions. Prototypes validated within this effort transition to 0604713A/Project 548 for System Development and Demonstration.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Joint Service Combat Ration Advanced Development	1.751	2.399	1.652	-	1.652
Description: This effort matures and integrates combat ration technologies and prototypes that enable warfighter maneuver, readiness and effectiveness during highly mobile, dispersed operations. Technologies are transitioned from RDTE Budget Activity 3 projects to provide individual and group combat rations and components with improved capabilities including improved warfighter physical and cognitive performance through optimized nutrition and a reduced logistics burden through weight and cube reduction.					
FY 2020 Plans: Will continue to validate and integrate S&T innovations and COTS/NDI candidate items into existing ration platforms (e.g. Meal, Ready-to-Eat, Unitized Group Ration) to increase operational effectiveness; will conduct T&E of S&T innovations and food component/packaging optimization efforts for integration into prototype CCARs to enable 7-day operations in the absence of resupply and improve readiness through significantly reduced weight, cube, and energy density; will initiate T&E of technologies for integration into prototype Expeditionary Group Rations (EGRs) to decrease the logistics burden and enable group feeding in austere environments; will transition validated prototypes to PE 0604713A/Project 548 for operational testing.					
FY 2021 Base Plans: Will continue to validate and integrate S&T innovations and COTS/NDI candidate items into existing ration platforms to increase operational effectiveness; will conduct T&E of technologies for integration into prototype Expeditionary Group Rations (EGRs) to decrease the logistics burden and enable group feeding in austere					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** 610 / *Food Adv Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
environments; will conduct T&E of non-destructive sampling technologies to meet Defense Health Agency Veterinary Services requirements for rapid detection of contaminants in food; and transition validated prototypes to PE 0604713A/Project 548 for operational testing and evaluation (OT&E). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funds realigned to support transition of validated Close Combat Assault Rations (CCAR) prototypes to OT&E					
Title: Joint Service Field Feeding Equipment and Menu Development ***Description:*** This effort matures and integrates field feeding equipment technologies and prototypes in support of the Navy, Air Force, and Marine Corps that reduce the logistics burden, improve efficiency, and decrease operation and support costs as directed by the DoD CFREB. This effort also conducts test and evaluation (T&E) on Navy Standard Core Menu components and preparation techniques to enhance efficiency through standardization across the fleet and reduce labor requirements. ***FY 2020 Plans:*** Will fabricate prototypes that improve the heating efficiency of rations while reducing overall weight, cube and total lifecycle costs; will initiate T&E of energy conservation technologies for Air Force (USAF) BEAR kitchens; will initiate T&E of upgrades to USMC Expeditionary Field Kitchen (EFK) and new kitchen for shore-based Navy expeditionary units; will initiate T&E of new products and food preparation techniques to enhance menu acceptance and reduce labor requirements; and will transition prototypes to PE 0604713A/Project 548 for operational test and evaluation (OT&E). ***FY 2021 Base Plans:*** Will conduct T&E of energy conservation technologies for USAF BEAR kitchens; will conduct T&E of upgrades to or new developments for expeditionary field kitchens for use by deployed units in austere environments; will continue to conduct T&E of new products and food preparation techniques to enhance menu acceptance and reduce labor requirements; and will transition prototypes to PE 0604713A/Project 548 for operational test and evaluation (OT&E). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Change in funding supports USD(R&E) priorities in support of the National Defense Strategy.	2.674	1.153	1.403	-	1.403
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638	-	0.169	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** 610 / *Food Adv Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	4.425	3.721	3.055	-	3.055

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 548: *Mil Subsistence Sys*	1.092	7.393	2.814	-	2.814	1.815	1.530	1.610	1.610	0.000	17.864

Remarks

D. Acquisition Strategy

Validated prototypes will transition to System Development and Demonstration for operational test and evaluation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) 610 / *Food Adv Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Feeding Program Management	Allot	CCDC Soldier Center, Natick, MA : Natick, MA	7.024	0.468	Oct 2018	0.287	Oct 2019	0.322	Oct 2020	-		0.322	Continuing	Continuing	Continuing
DLA Bill Pay	TBD	Various : Various	2.136	-		-		-		-		-	0.000	2.136	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.169		-		-		-	0.000	0.169	-
		Subtotal	9.160	0.468		0.456		0.322		-		0.322	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Service Rations and Combat Feeding Equipment	Various	Various : Various	35.001	3.555	Oct 2018	3.265	Oct 2019	2.451	Oct 2020	-		2.451	Continuing	Continuing	Continuing
		Subtotal	35.001	3.555		3.265		2.451		-		2.451	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Service Rations and Combat Feeding Equipment	Allot	CCDC Soldier Center, Natick, MA : Natick, MA	0.887	0.402	Oct 2018	-		0.282	Oct 2020	-		0.282	Continuing	Continuing	Continuing
		Subtotal	0.887	0.402		-		0.282		-		0.282	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	45.048	4.425		3.721		3.055		-		3.055	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** 610 / *Food Adv Development*

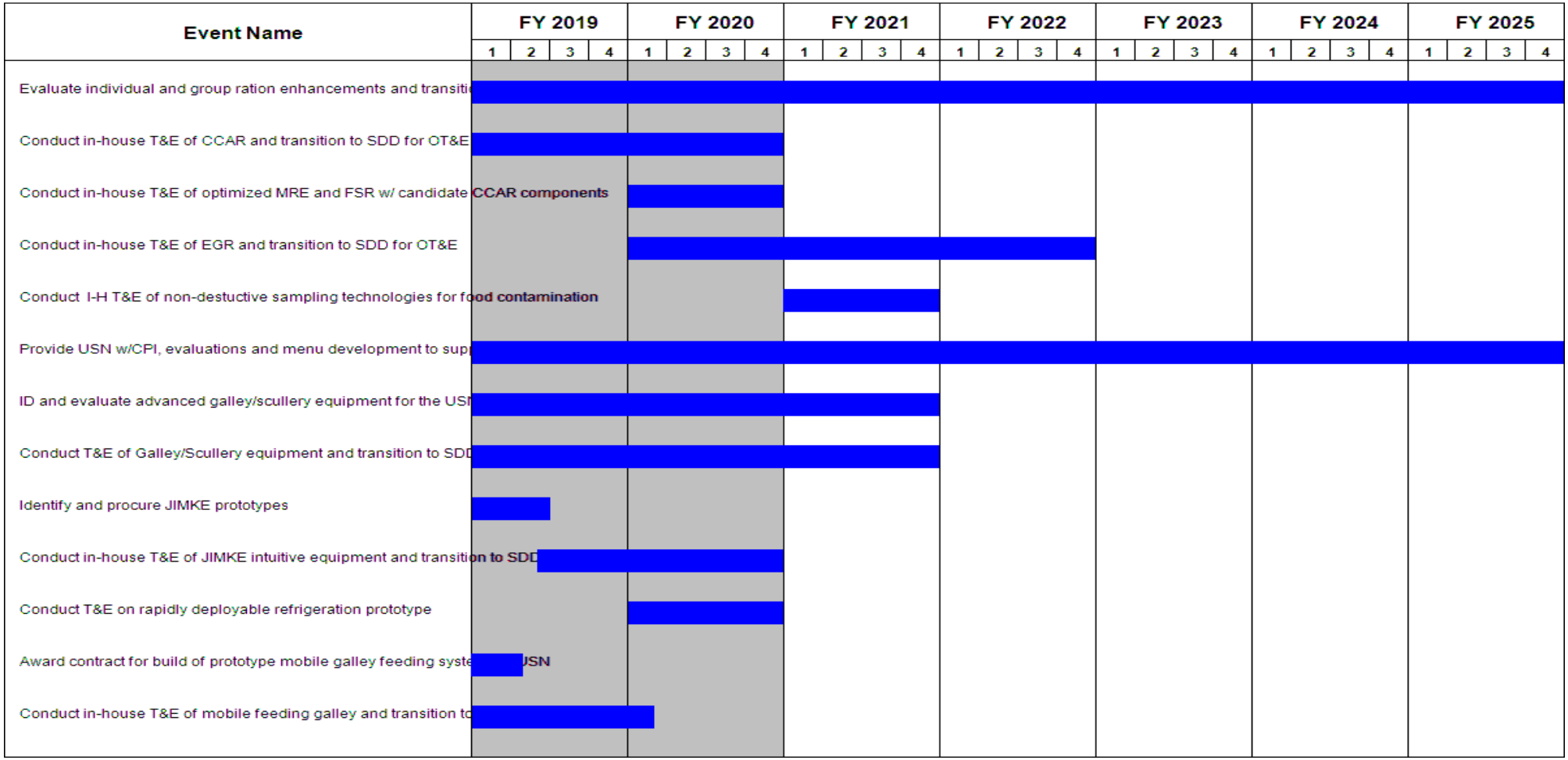

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** 610 / *Food Adv Development*

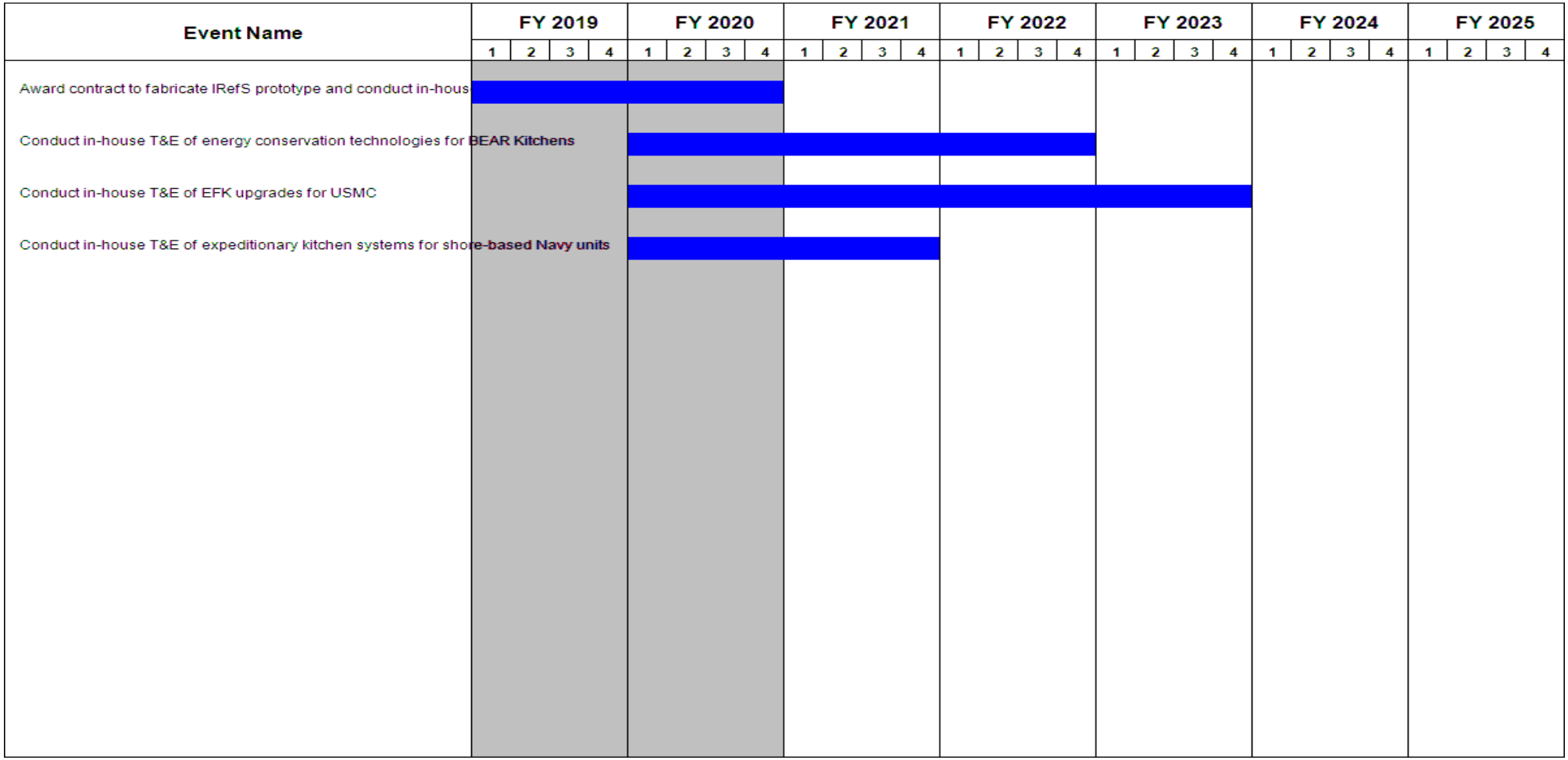

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** 610 / *Food Adv Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Evaluate individual and group ration enhancements and transition to SDD for OT&E	1	2017	4	2025
Conduct in-house T&E of CCAR and transition to SDD for OT&E	1	2019	4	2020
Conduct in-house T&E of optimized MRE and FSR w/ candidate CCAR components	1	2020	4	2020
Conduct in-house T&E of EGR and transition to SDD for OT&E	1	2020	4	2022
Conduct I-H T&E of non-destuctive sampling technologies for food contamination	1	2021	4	2021
Provide USN w/CPI, evaluations and menu development to support NSCM upgrades	1	2017	4	2025
ID and evaluate advanced galley/scullery equipment for the USN	1	2017	4	2021
Conduct T&E of Galley/Scullery equipment and transition to SDD for OT&E	1	2017	4	2021
Conduct in-house T&E of JSERCS prototype for BEAR Type I kitchen for USAF	1	2017	1	2018
Identify and procure JIMKE prototypes	1	2018	2	2019
Conduct in-house T&E of JIMKE intuitive equipment and transition to SDD for OT&E	2	2019	4	2020
Conduct T&E on rapidly deployable refrigeration prototype	1	2020	4	2020
Award contract for build of prototype mobile galley feeding system for USN	1	2018	1	2019
Conduct in-house T&E of mobile feeding galley and transition to SDD for OT&E	1	2019	1	2020
Award contract to fabricate IRefS prototype and conduct in-house T&E	1	2019	4	2020
Conduct in-house T&E of energy conservation technologies for BEAR Kitchens	1	2020	4	2022
Conduct in-house T&E of EFK upgrades for USMC	1	2020	4	2023
Conduct in-house T&E of expeditionary kitchen systems for shore-based Navy units	1	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) C08 / *Rapid Equipping Force*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
C08: *Rapid Equipping Force*	-	2.339	5.793	2.786	-	2.786	2.782	2.777	2.994	2.997	0.000	22.468
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Equipment mix and configuration may change based on changes in operational environment and circumstances.

A. Mission Description and Budget Item Justification

The REF FY 2021 RDT&E request is $2.786 million (Base) is for system integration, testing, and evaluation to support project requirements

The REF is the Army's Quick Reaction Capability (QRC) with the ability to acquire, integrate and sustain Commercial-Off-The Shelf (COTS), Government Off-The-Shelf (GOTS), Non-Developmental Item (NDI), and Non-Standard Equipment (NSE) solutions to meet urgent combat requirements for globally employed forces. It inserts selected future force technologies, capabilities, and surrogate materiel solutions into deployed, deploying, select-prepared to deploy, and transformational forces for operational evaluation, assessment, and evolutionary development. The REF assesses the provided capabilities to improve future solutions to inform materiel development for the future Army capability requirements and to potentially transition the capability to an Army acquisition program.

The REF is an enduring organization (Base funded) per Memorandum, Under Secretary of the Army, 30 Jan 2014, subject: Implementation Plan for Stabilization of the Rapid Equipping Force (REF).

The REF bridges the gap between the Army's traditional acquisition process and immediate equipping needs. The REF pursues tangible solutions that can be equipped rapidly with a goal of 180 days. The REF focuses on finding immediate and effective game-changing capabilities to increase Soldier Readiness, effectiveness, protection, and lethality in any operational environment. The REF 10-Liner process provides the ability to react quickly to an ever-changing enemy who changes in days and months, not years in a complex world. The REF coordinates with the Combatant Command (COCOMs) and Army Service Component Command (ASCCs) in theater to fully understand their urgent needs, for which the REF acquisition capability may identify, procure, deliver, and sustain solutions to the deployed units. Although the REF works directly with Operational Commanders at all levels, it focuses on Brigade level and below to equip solutions to identified capability gaps.

The Army Acquisition Executive designated Program Executive Office (PEO) Soldier as the Milestone Decision Authority (MDA) to institutionalize the acquisition authorities in support of the REF and to provide proper acquisition oversight while enhancing visibility of these efforts. The MDA will ensure flexibility and speed focused on the Soldier's needs serviced by the dedicated REF Program Management Office (PMO). This establishes a formal acquisition reporting chain that leverages existing reporting venues to ensure appropriate Assistant Secretary of the Army (Acquisition, Logistics and Technology) (ASA(ALT)) visibility, oversight, and direction.

The REF capabilities cross all Warfighter Functions:
1. Mission Command
2. Movement and Maneuver

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

3. Intelligence
4. Fires
5. Sustainment
6. Protection

The RDT&E funding also provides the REF the flexibility to invest in near-term, and innovative solutions. RDT&E funds are necessary in the majority of all REF projects. Most importantly, REF requires RDT&E funds to conduct safety certification (testing) for non-standard equipment before it is equipped to the Soldier. This critical requirement exists to ensure that REF-provided equipment is safe for Soldiers to use and that any risks are identified and documented. The REF also requires RDT&E funds to integrate several different COTS/GOTS and NDI technologies into one capability that solves the tougher and more complex problems.

The REF requires RDT&E funds to modify, test, and evaluate existing technologies that were developed for one purpose, however may be suitable to solve another problem. REF will also fund deliberate projects in support of technology-solution-scouting to meet anticipated Army needs and to mitigate operational gaps. These efforts measure and identify current technologies, and provide information to better inform Army Training and Doctrine Command (TRADOC) and other communities of interest, with the intent of enlightening future Army requirements. Example efforts that may require RDTE include the following projects: Tactical Satellite Communications (SATCOM) and communications systems; tactical and small Combat Out Post/Forward Operating Base (COP/FOB) Intelligence, Surveillance, and Reconnaissance (ISR) and Force Protection systems; Counter Unmanned Aerial Systems (CUAS); Electronic Warfare (EW) systems; Non-Tactical Vehicles (NTV); Persistent Duration UAS, and Subterranean (SubT) Operations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Rapid Equipping Force	2.339	5.667	2.786	-	2.786
Description: Funding is provided for the following effort. ***FY 2020 Plans:*** The REF partner with Army Service Component Commands (ASCC) forces and Army Special Operations Force (SOF) community to support globally deployed Soldiers and regionally aligned BCTs in all areas of responsibility. The REF anticipates increased uncertainty regarding the future of Operation Inherent Resolve (OIR) and other operations in the CENTCOM Area of Responsibility (AOR) requiring additional flexibility to develop technological solutions supporting the reduced numbers of Soldiers operating globally in order to fill force protection gaps in the face of a lethal terrorism threat. The REF expects to continue our engagement with the ASCCs to address capability gaps generated by geographical and environmental constraints. Conversely, the REF will increase its understanding of evolving threats and operating conditions within the respective ASCC areas of operations. The REF also expects to play a much more deliberate role in providing support to the Global Response Force (GRF) as they prepare for a wider range of response missions. In accordance with REF?s participation in the Office of					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Secretary of Defense (OSD) led quick reaction capability effort, the Army determined the REF would provide the Army?s warm base capability. REF Warfighter function areas 1. Mission Command 2. Movement and Maneuver 3. Intelligence 4. Fires 5. Sustainment 6. Protection The FY20 funds for projects in the amount of $279K (10% of Budget); breakout is based on the FY 2019 requirements trend. The REF anticipates ATEC testing and evaluation cost of $2.514 million. The REF requires RDT&E funds to test technologies in order to ensure suitability and safety before equipping the Soldier - any modified COTS/GOTS/ NDI item has to be tested. ***FY 2021 Base Plans:*** The REF will partner with ASCC forces and Army SOF community to support globally deployed Soldiers and regionally aligned BCTs in all areas of responsibility. The REF anticipates increased uncertainty regarding the future of Operation Inherent Resolve (OIR) and other operations in the CENTCOM Area of Responsibility (AOR) requiring additional flexibility to develop technological solutions supporting the reduced numbers of Soldiers operating globally in order to fill force protection gaps in the face of a lethal terrorism threat. The REF expects to continue our engagement with the ASCCs to address capability gaps generated by geographical and environmental constraints. Conversely, the REF will increase its understanding of evolving threats and operating conditions within the respective ASCC areas of operations. The REF also expects to play a much more deliberate role in providing support to the GRF as they prepare for a wider range of response missions. 1. Mission Command 2. Movement and Maneuver					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
3. Intelligence 4. Fires 5. Sustainment 6. Protection The FY 2021 funds for projects in the amount of $279K (10% of Budget); breakout is based on the current FY 2019 requirements trend. The REF anticipates ATEC testing and evaluation cost of $2.507 million. The REF requires RDT&E funds to test technologies in order to ensure suitability and safety before equipping the Soldier ? any modified COTS/GOTS/ NDI item has to be tested. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding from FY 2020 to FY 2021 is due to receiving fewer than estimated urgent Warfighter requirements.					
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.126	-	-	-
Accomplishments/Planned Programs Subtotals	2.339	5.793	2.786	-	2.786

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• M80101: *Rapid Equipping Soldier Support Equipment*	22.429	27.877	8.629	8.500	17.129	10.610	10.365	9.889	9.990	0.000	108.289

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

D. Acquisition Strategy

The Rapid Equipping Force (REF) harnesses current and emerging technologies to provide rapid solutions to the urgently required capabilities of U.S. Army Forces employed globally. The REF focus is on rapidly placing capabilities into Soldiers' hands. This mission is accomplished in one of two ways: 1) rapidly adapting COTS/ GOTS/NDI equipment to meet operational needs, and 2) utilizing emerging deployable capabilities via interaction with research and development organizations and academia. All capabilities are safety tested prior to insertion into operational environments. Training and sustainment are provided for every capability until it is transitioned to an approved acquisition program or terminated through an approved Army process. Operational assessments are conducted to provide feedback in support of Army requirements generation and future capability development. REF capabilities routinely serve as a bridge to specific ONS, JUONS, and JEONS gaps to meet urgent operational requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) C08 / *Rapid Equipping Force*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.126		-		-		-	0.000	0.126	-
		Subtotal	-	-		0.126		-		-		-	0.000	0.126	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mission Command	C/FFP	Various : Various	0.191	0.016		0.019		0.020		-		0.020	0.000	0.246	-
Movement and Maneuver	C/FFP	Various : Various	0.348	0.039		0.081		0.047		-		0.047	0.000	0.515	-
Intelligence	C/FFP	Various : Various	0.288	0.070		0.139		0.084		-		0.084	0.000	0.581	-
Fires	C/FFP	Various : Various	0.010	0.004		0.004		0.005		-		0.005	0.000	0.023	-
Sustainment	C/FFP	Various : Various	0.237	0.017		0.050		0.021		-		0.021	0.000	0.325	-
Protection	C/FFP	Various : Various	0.494	0.088		0.181		0.102		-		0.102	0.000	0.865	-
Dismounted Improvised Explosive Device (IED) Defeat	C/FFP	Various : Various	2.889	-		-		-		-		-	Continuing	Continuing	Continuing
Dismounted Operations Support	C/FFP	Various : Various	4.796	-		-		-		-		-	Continuing	Continuing	Continuing
Intelligence, Surveillance, and Reconnaissance (ISR) Shortfalls in Environmentally Inhospitable OEs	C/FFP	Various : Various	5.951	-		-		-		-		-	Continuing	Continuing	Continuing
Small Combat Outpost (COP) / Patrol Base (PB) Force Protection and Sustainment	C/FFP	Various : Various	3.738	-		-		-		-		-	Continuing	Continuing	Continuing
Other-REF RIPL Priorities (5-10)	C/FFP	Various : Various	8.778	-		-		-		-		-	Continuing	Continuing	-
Other	C/FFP	Various : Various	2.208	-		-		-		-		-	0.000	2.208	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Base: Various Projects-Protect the Force in Counter Insurgency	C/FFP	Various : Various	11.841	-		-		-		-		-	0.000	11.841	-
Small Combat Outpost (COP)/Patrol Base (PB) Sustainment	C/FFP	Various : Various	1.506	-		-		-		-		-	0.000	1.506	-
Base: Various Projects-Enhance Intelligence Surveillance Recon	C/FFP	Various : Various	9.009	-		-		-		-		-	0.000	9.009	-
Small Combat Outpost (COP)/Patrol Base (PB) Force Protection	C/FFP	Various : Various	2.093	-		-		-		-		-	0.000	2.093	-
Dismounted Blue Force Tracking and Mission Command	C/FFP	Various : Various	0.528	-		-		-		-		-	0.000	0.528	-
Base: Various Projects-Logistics/Medical in Counterinsurgency Ops	C/FFP	Various : Various	1.639	-		-		-		-		-	0.000	1.639	-
Base: Various Projects-Timeliness of Analysis and Information Dissemination	C/FFP	Various : Various	6.961	-		-		-		-		-	0.000	6.961	-
Congressional Add-Squad Mission Support System (SMSS)	C/FFP	Various : Various	1.600	-		-		-		-		-	0.000	1.600	-
SSTR/Economic Assumptions/FFRDC and SBIR	C/FFP	Various : Various	1.090	-		-		-		-		-	0.000	1.090	-
OCO: Rapid Equipping Force	C/FFP	Various : Various	19.190	-		-		-		-		-	0.000	19.190	-
		Subtotal	85.385	0.234		0.474		0.279		-		0.279	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) C08 / *Rapid Equipping Force*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ATEC (REF Integrated Priority List 1-10)	C/FFP	Various : Various	11.344	-		-		-		-		-	Continuing	Continuing	Continuing
ATEC (Warfighter Function Areas)	C/FFP	Various : Various	14.114	2.105		5.193		2.507		-		2.507	0.000	23.919	-
ATEC (REF Integrated Priority List 1-7)	C/FFP	Various : Various	2.000	-		-		-		-		-	0.000	2.000	-
		Subtotal	27.458	2.105		5.193		2.507		-		2.507	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	112.843	2.339		5.793		2.786		-		2.786	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

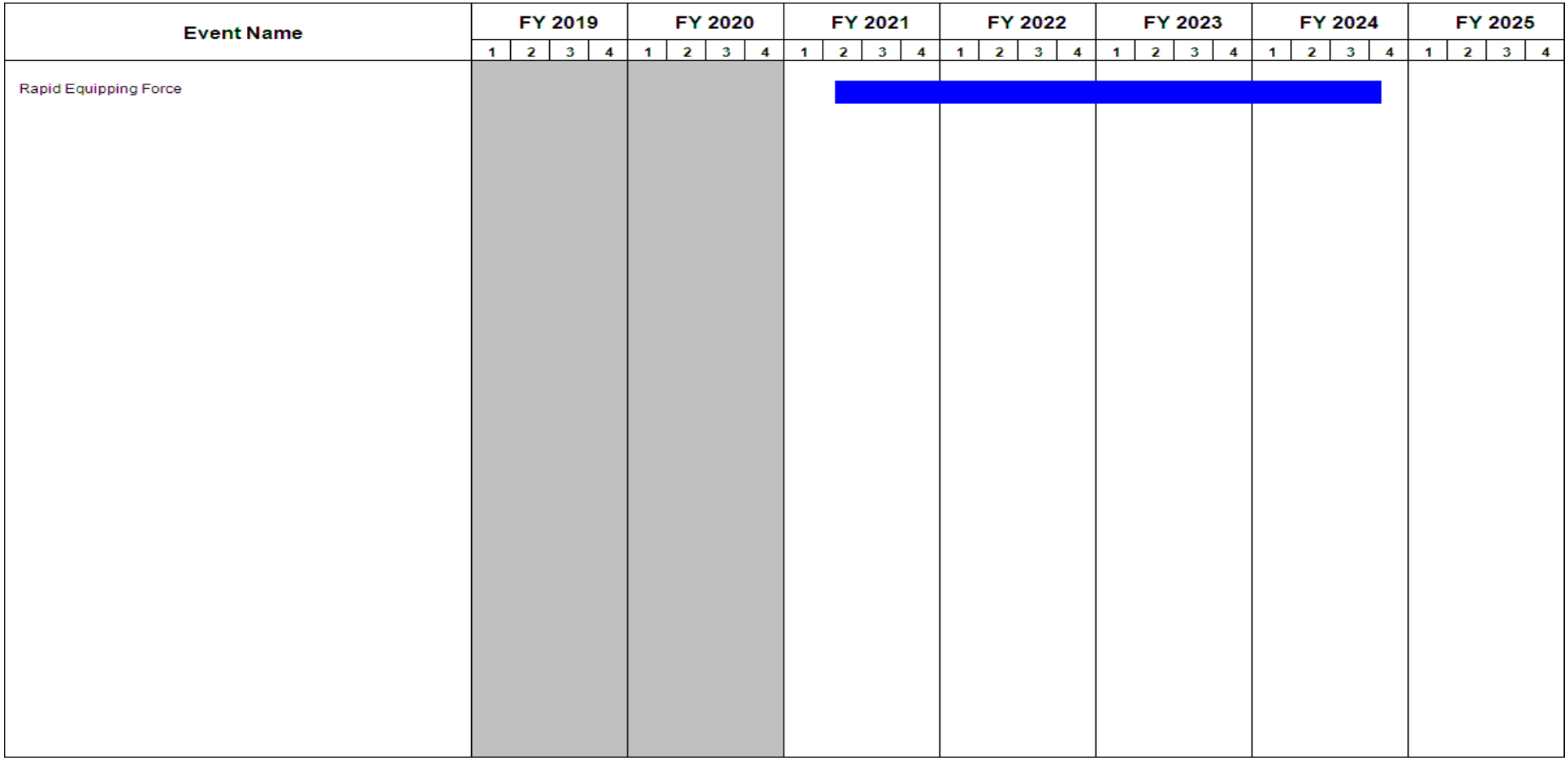

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** C08 / *Rapid Equipping Force*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Equipping Force	2	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / *Soldier Support and Survivability*	Project (Number/Name) EL1 / *Army Field Feeding Programs*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EL1: *Army Field Feeding Programs*	-	1.303	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.303
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EL1 efforts complete in FY 2019

A. Mission Description and Budget Item Justification

This Project provides for the advanced component development and prototyping of Army combat feeding equipment designed to reduce the logistics burden and Operation and Support (O&S) costs of subsistence support to service personnel. Project supports development of rapidly deployable field food service equipment in coordination with ration development efforts. Project conducts demonstration and validation of improved subsistence support items used to enhance soldier effectiveness and quality of life. This project develops critical enablers that support the Joint Future Force Capabilities and the Joint Expeditionary Mindset by maintaining readiness through fielding and integrating new equipment. This equipment enhances the field Soldier's well-being and provides the Soldier with usable equipment, in addition to reducing sustainment requirements, related Combat Support/Combat Service Support (CS/CSS) demands on lift, combat zone footprint, and costs for logistical support.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Containerized Food Sanitation Center (CFSC) ***Description:*** Develop and Test a Containerized Food Sanitation Center (CFSC) that meets the requirements of the Force Provider Expeditionary (FPE) and uses fuel fired water heating to improve energy efficiency..	1.303	-	-	-	-
Accomplishments/Planned Programs Subtotals	1.303	-	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EL2: *Army Field Feeding Equipment*	3.301	-	0.000	-	0.000	-	-	-	-	0.000	3.301
• M65806: *Assault Kitchen (AK)*	4.587	1.673	0.000	-	0.000	-	-	-	-	0.000	6.260
• M65801: *REFRIGERATED CONTAINER SYSTEMS*	9.140	14.300	0.000	2.279	2.279	-	-	-	-	0.000	25.719
• R62830: *Battlefield Kitchen (BK)*	2.024	-	0.000	-	0.000	-	-	-	-	0.000	2.024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** EL1 / *Army Field Feeding Programs*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

Project development will transition to Engineering and Manufacturing Development (EMD) and into production after thorough testing.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** EL1 / *Army Field Feeding Programs*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support	Various	PMFSS : Natick, MA	0.477	0.489	Nov 2018	-		-		-		-	0.000	0.966	-
		Subtotal	0.477	0.489		-		-		-		-	0.000	0.966	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Battlefield Kitchen	Various	PMFSS : Natick, MA	2.632	-		-		-		-		-	0.000	2.632	-
ECD for MTRCS	Various	Various : Various	0.125	-		-		-		-		-	0.000	0.125	-
DESERT	Various	PMFSS : Natick, MA	0.177	-		-		-		-		-	0.000	0.177	-
FSC III	Various	Various : Various	-	0.464	Nov 2018	-		-		-		-	0.000	0.464	-
		Subtotal	2.934	0.464		-		-		-		-	0.000	3.398	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FSC III	TBD	PMFSS Natick, MA : PMFSS Natick, MA	-	0.350	May 2019	-		-		-		-	0.000	0.350	-
		Subtotal	-	0.350		-		-		-		-	0.000	0.350	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.411	1.303		0.000		-		-		-	0.000	4.714	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** EL1 / *Army Field Feeding Programs*

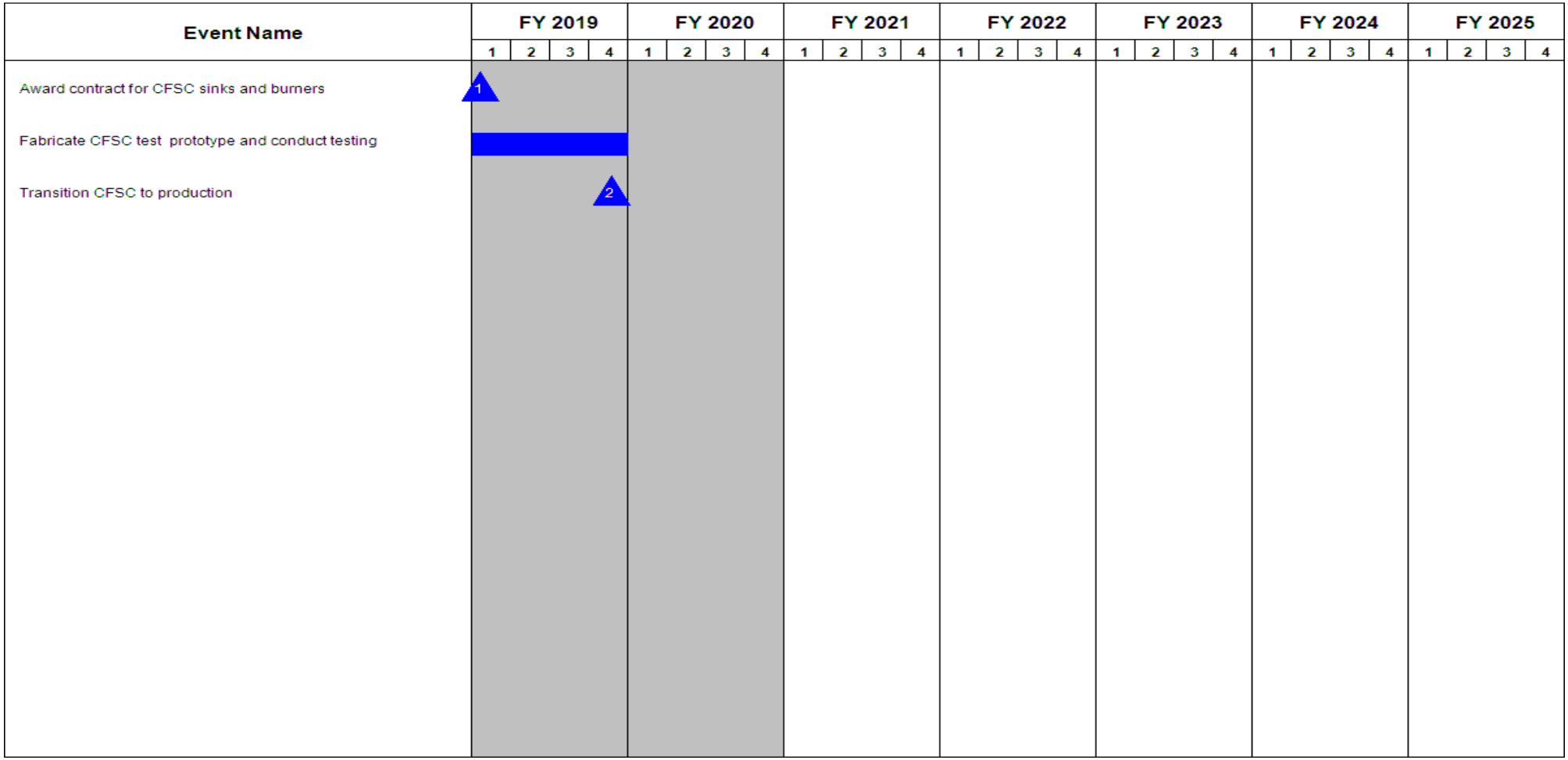

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603747A / *Soldier Support and Survivability*	**Project (Number/Name)** EL1 / *Army Field Feeding Programs*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Award contract for CFSC sinks and burners	1	2019	1	2019
Fabricate CFSC test prototype and conduct testing	1	2019	4	2019
Transition CFSC to production	4	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603766A *I Tactical Electronic Surveillance System - Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	35.667	37.490	194.775	-	194.775	105.297	82.506	72.221	42.440	Continuing	Continuing
907: *Tactical Exploitation Of National Capabilities-MIP*	-	35.667	37.490	194.775	-	194.775	105.297	82.506	72.221	42.440	Continuing	Continuing

Note

All funding is in support of the ACTIVE COMPONENT

A. Mission Description and Budget Item Justification

The Tactical Exploitation of National Capabilities (TENCAP) program serves as the Army's centralized lead to perform National Intelligence cross-agency engineering to evaluate, enhance, prototype, and transition Intelligence, Surveillance, and Reconnaissance (ISR) technologies/capabilities developed by Science and Technology (S&T) and other activities across the National Intelligence Community (IC) into Army systems and architectures. TENCAP: (1) ensures continued access to current National and Theater sensors and supporting tactical architectures; and (2) exploits new developments that focus on improving the Analysis and Tasking, Collection, Processing, Exploitation, Dissemination and Feedback (TCPEDF) of intelligence data. This includes efforts to: (1) shorten targeting timelines down to the Platoon level; (2) enhance target identification; (3) provide better target location (accuracy); (4) provide continued coverage of a target; and (5) develop in-theater analytic tools to enable data exploitation in near real-time support to contingency operations.

Tactical Intelligence Targeting Access Node (TITAN) Space prototype system will provide timely assured intelligence for long range precision fires and maneuver in connected and A2AD environments; Assured access to Space ISR: National, Army and Commercial; Software Analytics capability to enable the intelligence cycle with increased speed, precision and accuracy Automated/Assisted Sensor-to-Shooter workflows: speed, scalability, accuracy to support LRPF in an A2AD environment; Modern and consolidated ground station for space and select aerial sensors. TITAN is pending the creation of its own project line 643766.BX9 in FY 2022, once the strategy and validation of the requirement can be finalized within HQDA.

The Multi Domain Sensor System (MDSS) will provide multiple sensing capabilities by developing and prototyping survivable sensor capabilities on higher altitude platforms that can perform effective stand-off operations. MDSS will exploit and disrupt enemy Radio Frequency (RF) capabilities and systems. They include Electronic Intelligence (ELINT), Communications Intelligence (COMINT), Synthetic Aperture Radar (SAR), Moving Target Indicator (MTI), Cyber/EW, Air-Launched Effects (ALE) and Aircraft Survivability sensors. These will allow stand-off operations to detect, locate, identify and track critical targets for the ground commander. Developing and demonstrating this sensing capabilities on higher altitude platforms is the first step toward gaining advantage against threats posed by adversarial anti-access and area-denial efforts in the competition phase of operations.

The Low Earth Orbit (LEO) strategy will provide prototyping, development and experimentation of the Tactical Space Layer (TSL) sensors (electro optical, synthetic aperture radar, 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. Follow-on persistent prototype tactical sensor capabilities will be integrated with the Army

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603766A *I Tactical Electronic Surveillance System - Adv Dev*

Tactical Intelligence Targeting Access Node (TITAN) ground station which will provide direct tasking and assured access directly supporting live-fire S2S demonstrations and assessments. The Low Earth Orbit (LEO) realignment from Program Element (PE) 1206308A Project FE5 to PE 0603766A Project 907 occurs in FY 2022.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	35.667	34.890	26.257	-	26.257
Current President's Budget	35.667	37.490	194.775	-	194.775
Total Adjustments	0.000	2.600	168.518	-	168.518
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-7.400			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	168.518	-	168.518

Change Summary Explanation

The addition of $52M in FY21 was due to the Multi-Domain Sensing System (MDSS) new start

The addition of $86.6M in FY21 was due to the Low Earth Orbit (LEO) realignment from Program Element (PE) 1206308A Project FE5 to PE 0603766A Project 907

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	Project (Number/Name) 907 / *Tactical Exploitation Of National Capabilities-MIP*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
907: *Tactical Exploitation Of National Capabilities-MIP*	-	35.667	37.490	194.775	-	194.775	105.297	82.506	72.221	42.440	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

All funding is in support of the ACTIVE COMPONENT.

A. Mission Description and Budget Item Justification

The Tactical Exploitation of National Capabilities (TENCAP) office serves as the Army's centralized lead to perform National Intelligence cross-agency engineering to evaluate, enhance, prototype, and transition Intelligence, Surveillance and Reconnaissance (ISR) technologies/capabilities developed by Science and Technology (S&T) and other activities across the National Intelligence Community (IC) into Army systems and architectures. TENCAP: (1) ensures continued access to current National and Theater sensors and supporting tactical architectures; and (2) exploits and influences new developments that focus on improving the Analysis and Tasking, Collection, Processing, Exploitation, Dissemination and Feedback (TCPEDF) of intelligence data. This includes efforts to: (1) shorten targeting timelines down to the Platoon level; (2) enhance target identification; (3) provide better target location (accuracy); (4) provide continued coverage of a target; and (5) develop in-theater analytic tools to enable data exploitation in near real-time support to contingency operations.

FY 2021 Base funding in the amount of $55.975 million provides: (1) Per direction of the Army ISR Task Force and Future Command, initial risk reduction, analytics and engineering development of the prototype for Tactical Intelligence Targeting Access Node (TITAN) space system; (2) Advanced Miniaturized Data Acquisition System (AMDAS) 'Next' system development; AMDAS Dissemination Vehicle (ADV) improvements; Remote Ground Terminal (RGT) development in order to support TITAN Space risk reduction, analytics and prototyping efforts; (3) engineering and collaborative development on multiple validated National Intelligence Community (IC) advanced software and prototype developments that leverage National IC investments for Army use and ensure continuous Army interoperability with National IC assets and architectures; (4) advanced development of capabilities for Air Vigilance (AV) Army Program of Record; and (5) development of TENCAP Radio Frequency Exploitation (TRFE) effort to support future synchronization of SIGINT, Cyber and Electronic Warfare operations.

Multi-Domain Sensing System (MDSS) - FY 2021 base dollars in the amount of $52 million supports MDSS development and prototyping. The Multi Domain Sensor System (MDSS) will provide multiple sensing capabilities by developing and prototyping survivable sensor capabilities on higher altitude platforms that can perform effective stand-off operations. MDSS will exploit and disrupt enemy Radio Frequency (RF) capabilities and systems. They include Electronic Intelligence (ELINT), Communications Intelligence (COMINT), Synthetic Aperture Radar (SAR), Moving Target Indicator (MTI), Cyber/EW, Air-Launched Effects (ALE) and Aircraft Survivability sensors. These will allow stand-off operations to detect, locate, identify and track critical targets for the ground commander. Developing and demonstrating this sensing capabilities on higher altitude platforms is the first step toward gaining advantage against threats posed by adversarial anti-access and area-denial efforts in the competition phase of operations.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

The Low Earth Orbit (LEO) FY 2021 base dollars in the amount of $86.80 million dollars supports the prototyping, development, and experimentation of Tactical Space Layer (TSL) sensors (electro optical, synthetic aperture radar, and radio frequency) 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. Follow-on persistent prototype tactical sensor capabilities will be integrated with the Army Tactical Intelligence Targeting Access Node (TITAN) ground station which will provide direct tasking and assured access directly supporting live-fire S2S demonstrations and assessments. This is not a new start project. LEO ISR project transitions from Program Element (PE) 1206308A Project FE5 to PE 0603766A Project 907

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: TENCAP Cross-agency Core Engineering activities ***Description:*** By utilizing organic and matrix engineering subject matter experts, TENCAP collaborates, develops and exploits emerging multi-intelligence based technologies to satisfy/accelerate Army Intelligence, Surveillance, Reconnaissance (ISR), Mission Command and Force Protection requirements. ***FY 2020 Plans:*** Will work to incorporate Army requirements into earliest stages of National developments; Ensure Army access to sensors and multi-intelligence based capabilities; Monitor emerging technologies and systems; Exploit advances in commercial imagery and signal technologies; Develop prototypes that improve Army intelligence products. ***FY 2021 Plans:*** Will work to incorporate Army requirements into earliest stages of National developments; Ensure Army access to sensors and multi-intelligence based capabilities; Monitor emerging technologies and systems; Exploit advances in commercial imagery and signal technologies; Develop prototypes that improve Army intelligence products. Approximately 50% of the core TENCAP resources will be in the development and integration of TITAN Space prototype. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds align to TENCAP engineering and management efforts that includes initial studies and designs, and progresses to prototype development and testing.	10.634	14.605	10.845
Title: Air Vigilance - Advanced Development ***Description:*** Enhance intelligence, force protection, and indications and warning capabilities under Army TENCAP program. ***FY 2020 Plans:*** Will continue to develop advanced signal and software enhancements for Air Vigilance (AV) Army Program of Record that support the programs Capability Drops. ***FY 2021 Plans:***	5.163	5.479	4.034

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will continue to develop advanced signal and software enhancements for Air Vigilance (AV) Army Program of Record that support the programs Capability Drops. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds align to software changes required by capability drop requirements and newly identified and/or evolving threats.			
Title: Advanced Miniaturized Data Acquisition System(AMDAS)/ AMDAS Dissemination Vehicle (ADV) ***Description:*** Continue advanced engineering and development efforts to ensure continued interoperability and effectiveness of Army Corp-level TENCAP subsystems that provide national data to the tactical warfighter via intelligence community partners classified national systems. Will become subsystem to TITAN Space prototype. ***FY 2020 Plans:*** AMDAS Next: Will continue the development of TENCAP new prototype subsystem antenna, which will include modeling and simulation along with early developmental testing. Continued work on advance sensor development, and design ground processor, to ensure alignment with evolving national architectural enhancements as the National Technical Means (NTM) capabilities progress. ***FY 2021 Plans:*** AMDAS Next: Will continue the development of TENCAP new prototype subsystem antenna, which will include modeling and simulation along with early developmental testing. Continued work on advance sensor development, and design ground processor, to ensure alignment with evolving national architectural enhancements as the National Technical Means (NTM) capabilities progress. Will become subsystem to TITAN Space prototype. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds align with progression of engineering efforts from requirement refinement, studies and initial design development, into system sub-element prototype development and initial developmental testing.	14.760	14.559	8.918
Title: TENCAP Radio Frequency Exploitation (TRFE) ***Description:*** Prototype capability software that informs, influences and enhances MULTI-INT sensor systems within PEO IEW&S such as Terrestrial Layer System (TLS) by targeting modern digital communications systems employed by near-peer nation state armies. Assists with Battlespace RF Characterization for modern communication environments with the intent to synchronize SIGINT, Cyber and Electronic Warfare operations. Utilizes commercial industry components and architectures to minimize hardware costs, risk and maximizes scalability/modularity. ***FY 2020 Plans:***	5.092	2.847	2.178

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Continue to develop the MULTI-INT TRFE cognitive software based SIGINT-Enabled Electronic Warfare and Cyber Attack prototype capability focused on countering Peer State and modern communication targets and threats. ***FY 2021 Plans:*** Continue to develop the MULTI-INT TRFE cognitive software based SIGINT-Enabled Electronic Warfare and Cyber Attack prototype capability focused on countering Peer State and modern communication targets and threats. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decrease align with the advanced development and prototyping efforts.			
Title: Tactical Intelligence Targeting Access Node (TITAN) Space Prototype System ***Description:*** Tactical Intelligence Targeting Access Node (TITAN) Space prototype system will provide timely assured intelligence for long range precision fires and maneuver in connected and A2AD environments; Assured access to Space ISR: National, Army and Commercial; Software Analytics capability to enable the intelligence cycle with increased speed, precision and accuracy Automated/Assisted Sensor-to-Shooter workflows: speed, scalability, accuracy to support LRPF in an A2AD environment; Modern and consolidated ground station for space and select aerial sensors TITAN is pending the creation of its own project line 643766BX9 in FY 2022 once the strategy and validation of the requirement can be finalized within HQDA. ***FY 2021 Plans:*** Continue the development and integration of the TITAN space prototype system that will provide rapid availability of National Overhead Systems (NOS) GEOINT and SIGINT capability. Continue to develop and integrate with the Remote Ground Terminal (RGT) and LEO constellation, the downlink, ingest and processing of commercial imagery. Continue the development and integration of automated target recognition along with integrating the fires architecture to support Army's #1 priority, Long Range Precision Fires (LRPF). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 increase supports advanced development and prototyping efforts.	-	-	30.000
Title: Multi-Domain Sensing System (MDSS) ***Description:*** The Multi Domain Sensor System (MDSS) will provide multiple sensing capabilities by developing and prototyping survivable sensor capabilities on higher altitude platforms that can perform effective stand-off operations. They include Electronic Intelligence (ELINT), Communications Intelligence (COMINT), Synthetic Aperture Radar (SAR), Moving Target Indicator (MTI), Cyber/EW, Air-Launched Effects (ALE) and Aircraft Survivability sensors.	-	-	52.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
MDSS is pending the creation of its own project line in FY 2022 once the strategy and validation of the requirement can be finalized within HQDA. ***FY 2021 Plans:*** Funding supports MDSS prototype efforts ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 increase supports new MDSS prototype effort			
Title: Low Earth Orbit Satellite Capability ***Description:*** The Low Earth Orbit (LEO) effort will support the prototyping, development, and experimentation of Tactical Space Layer (TSL) sensors (electro optical, synthetic aperture radar, and radio frequency) 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. ***FY 2021 Plans:*** Provides for follow-on persistent prototype, development, and experimentation of tactical sensor capabilities which will be integrated with the Army Tactical Intelligence Targeting Access Node (TITAN) ground station which will provide direct tasking and assured access directly supporting live-fire S2S demonstrations and assessments. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding increase supports the Low Earth Orbit Satellite prototype effort	-	-	86.800
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun ***Description:*** FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.018	-	-
Accomplishments/Planned Programs Subtotals	35.667	37.490	194.775

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 0605766A: *National Capabilities Integration (MIP)*	12.340	7.835	7.670	-	7.670	11.671	11.044	11.289	13.600	0.000	75.449
• OMA - 122011: *Contractor Logistics Support and Other Weapon Support*	2.052	-	2.132	-	2.132	2.175	2.217	2.285	2.330	0.000	13.191

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

The Army Tactical Exploitation of National Capabilities (TENCAP) mission is a Congressionally-mandated and chartered enduring requirement to leverage National Intelligence capabilities useful to the tactical Army. The Army TENCAP acquisition strategy is driven by an annual TENCAP General Officer Steering Group (TGOSG), co-chaired by the Army G2, Army G8, Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology [ASA(ALT)], and includes representatives from the Army G3, Army G6, Army Training and Doctrine Command (TRADOC), and the Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S). The TGOSG reviews, validates, prioritizes, and guides Army TENCAP efforts, according to Army and Defense strategy. Based on the TGOSG guidance, Army TENCAP invests BA 6.4 RDTE in Intelligence Community (IC) developments during the more cost-effective advanced development phase to ensure Army requirements are met with minimal redundancy to Army investments. Army TENCAP then uses BA 6.5 RDTE to manage the transition of these advanced development efforts through system development and integration into Army Programs of Record (POR). This strategy ensures these leveraged investments remain viable through multiple budget cycles, significantly increasing successful transition to recipient Army PORs. With acquisition discipline and oversight provided by PEO IEW&S, Army TENCAP executes the TGOSG approved efforts through use of multiple contracts and agreements with the military, National Intelligence agencies, labs, industry partners and academia for the full duration required to complete development and transition these national capabilities into enduring Army programs.

Tactical Intelligence Targeting Access Node (TITAN) Space prototype system will provide timely assured intelligence for long range precision fires and maneuver in connected and A2AD environments; Assured access to Space ISR: National, Army and Commercial; Software Analytics capability to enable the intelligence cycle with increased speed, precision and accuracy Automated/Assisted Sensor-to-Shooter workflows: speed, scalability, accuracy to support LRPF in an A2AD environment; Modern and consolidated ground station for space and select aerial sensors TITAN is pending the creation of its own project line 643766BX9 in FY 2022 once the strategy and validation of the requirement can be finalized within HQDA.

Multi-Domain Sensing System (MDSS) - FY 2021 base dollars in the amount of $52 million supports MDSS development. The Multi Domain Sensor System (MDSS) will provide multiple sensing capabilities by developing and prototyping survivable sensor capabilities on higher altitude platforms that can perform effective stand-off operations. MDSS will exploit and disrupt enemy Radio Frequency (RF) capabilities and systems. They include Electronic Intelligence (ELINT), Communications Intelligence (COMINT), Synthetic Aperture Radar (SAR), Moving Target Indicator (MTI), Cyber/EW, Air-Launched Effects (ALE) and Aircraft Survivability sensors. These will allow stand-off operations to detect, locate, identify and track critical targets for the ground commander. Developing and demonstrating this sensing capabilities on higher altitude platforms is the first step toward gaining advantage against threats posed by adversarial anti-access and area-denial efforts in the competition phase of operations.

The Low Earth Orbit (LEO) FY 2021 base dollars in the amount of $86.80 million dollars supports the prototyping, development, and experimentation of Tactical Space Layer (TSL) sensors (electro optical, synthetic aperture radar, and radio frequency) 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. On-going Army S&T, Joint Capability Technology

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

Demonstrations, National and industry prototype efforts will continue experimentation in FY21. Follow-on persistent prototype tactical sensor capabilities will be integrated with the Army Tactical Intelligence Targeting Access Node (TITAN) ground station which will provide direct tasking and assured access directly supporting live-fire S2S demonstrations and assessments.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TENCAP Intelligence Engineers (SETA)	C/FPAF	Perspecta : Alexandria, VA	22.731	3.015	Jan 2019	3.100	Jan 2020	1.500	Jan 2021	-		1.500	0.000	30.346	Continuing
TENCAP Intelligence Engineers(Matrix Gov)	MIPR	Army Geospatial Cener (AGC) : Alexandria, VA	7.257	1.300	Jan 2019	2.300	Jan 2020	1.200	Jan 2021	-		1.200	0.000	12.057	Continuing
TENCAP Intelligence Engineers (SETA) for TITAN Space prototype development	C/TBD	TBD : TBD	-	-		-		1.307	Jan 2021	-		1.307	0.000	1.307	Continuing
TENCAP Intelligence Engineers (Matrix Gov) for TITAN Space prototype development	MIPR	Army Geospatial Center (AGC) : Alexandria, VA	-	-		-		0.900	Jan 2021	-		0.900	0.000	0.900	-
SETA Support MDSS	TBD	PM SAI : Aberdeen, MD	-	-		-		2.000	Nov 2020	-		2.000	0.000	2.000	-
SETA Support LEO	TBD	A-PNT / TENCAP : Multiple locations	-	-		-		5.000	Jan 2021	-		5.000	0.000	5.000	-
FY 2018 NDAA SEC 825 MDAP Cost Overrun	TBD	TENCAP : Alexandria	-	0.018		-		-		-		-	0.000	0.018	-
		Subtotal	29.988	4.333		5.400		11.907		-		11.907	0.000	51.628	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TENCAP Core (Focus) Areas	Various	Multiple : Multiple	18.491	3.161	Feb 2019	5.980	Feb 2020	5.920	Feb 2021	-		5.920	0.000	33.552	Continuing
Air Vigilance	MIPR	Classified : MIPR	9.575	5.163	Jan 2019	5.479	Jan 2020	4.034	Jan 2021	-		4.034	0.000	24.251	Continuing
AMDAS/ADV (capability transitions to TITAN Space prototype)	MIPR	Classified : MIPR	17.690	14.760	Jan 2019	12.959	Jan 2020	8.918	Jan 2021	-		8.918	0.000	54.327	Continuing
TRFE	MIPR	Classified : MIPR	-	5.121	Jan 2019	2.847	Jan 2020	2.178	Jan 2021	-		2.178	0.000	10.146	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TITAN Space prototype development	C/TBD	Classified : TBD	-	-		-		24.102	Jan 2021	-		24.102	0.000	24.102	Continuing
MDSS Sensor Improvements (LRR)	TBD	TBD : TBD	-	-		-		12.000	Nov 2020	-		12.000	0.000	12.000	-
MDSS Flyoff Contracts	TBD	TBD : TBD	-	-		-		9.000	Feb 2021	-		9.000	0.000	9.000	-
MDSS Sensor Development Contract	TBD	TBD : TBD	-	-		-		24.750	Jul 2021	-		24.750	0.000	24.750	-
LEO Contracts	TBD	A-PNT / TENCAP : Multiple Locations	-	-		-		70.400	Jan 2021	-		70.400	0.000	70.400	-
		Subtotal	45.756	28.205		27.265		161.302		-		161.302	0.000	262.528	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TENCAP Prgm Mgmt-Dir Gov,travel,etc.	Allot	Army TENCAP : Alexandria, VA	13.731	2.258	Jan 2019	3.900	Jan 2020	2.311	Jan 2021	-		2.311	0.000	22.200	Continuing
TENCAP Secured Facilities	MIPR	Army Geospatial Center (AGC) : Alexandria, VA	3.102	0.475	Jan 2019	0.500	Jan 2020	0.525	Jan 2021	-		0.525	0.000	4.602	Continuing
TENCAP Prgm Mgmt - TITAN Space prototype development	Allot	Army TENCAP : Alexandria, VA	-	-		-		1.800	Jan 2021	-		1.800	0.000	1.800	Continuing
Prog Mgmt- MDSS	TBD	PM SAI : Aberdeen, MD	-	-		-		2.500	Nov 2020	-		2.500	0.000	2.500	-
LEO Prog Mgmt	TBD	A-PNT / TENCAP : Multple Locations	-	-		-		3.400	Oct 2020	-		3.400	0.000	3.400	-
		Subtotal	16.833	2.733		4.400		10.536		-		10.536	0.000	34.502	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	Project (Number/Name) 907 / *Tactical Exploitation Of National Capabilities-MIP*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TENCAP Lab Tests, Exercises, Simulations	MIPR	Multiple : Multiple	1.810	0.396	Jan 2019	0.425	Jan 2020	0.400	Jan 2021	-		0.400	0.000	3.031	Continuing
Test and Exercises - TITAN Space prototype development	TBD	Multiple : Multiple	-	-		-		0.880	Jan 2021	-		0.880	0.000	0.880	-
Flyoff Test Support	TBD	TBD : TBD	-	-		-		1.750	Nov 2020	-		1.750	0.000	1.750	-
LEO Tests	TBD	A-PNT / TENCAP : Multiple Locations	-	-		-		8.000	Mar 2021	-		8.000	0.000	8.000	-
		Subtotal	1.810	0.396		0.425		11.030		-		11.030	0.000	13.661	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	94.387	35.667		37.490		194.775		-		194.775	0.000	362.319	N/A

Remarks

The Low Earth Orbit (LEO) funding will be realigned from Program Element (PE) 1206308A Project FE5 to PE 0603766A Project 907 starting in FY21

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

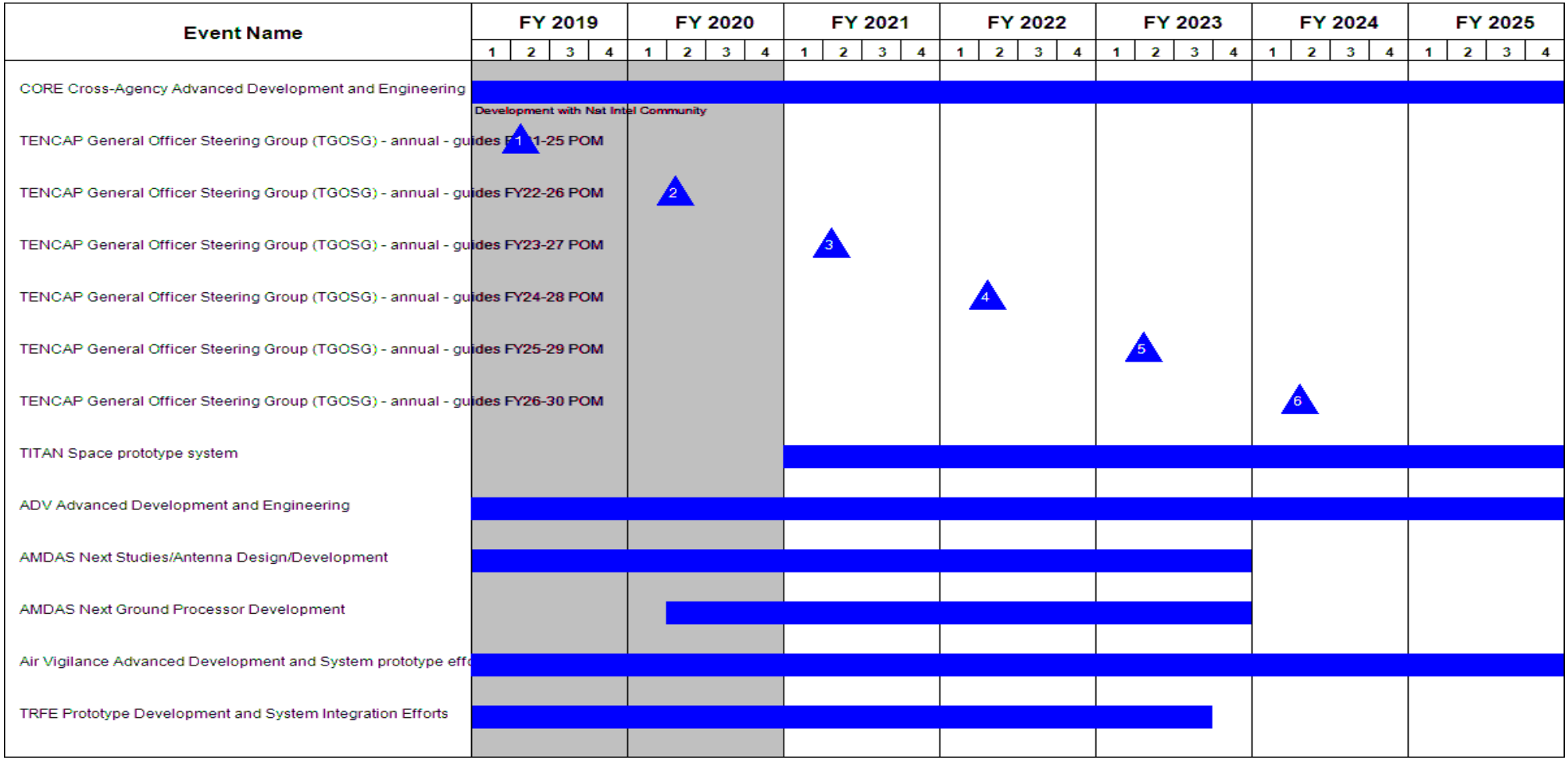

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

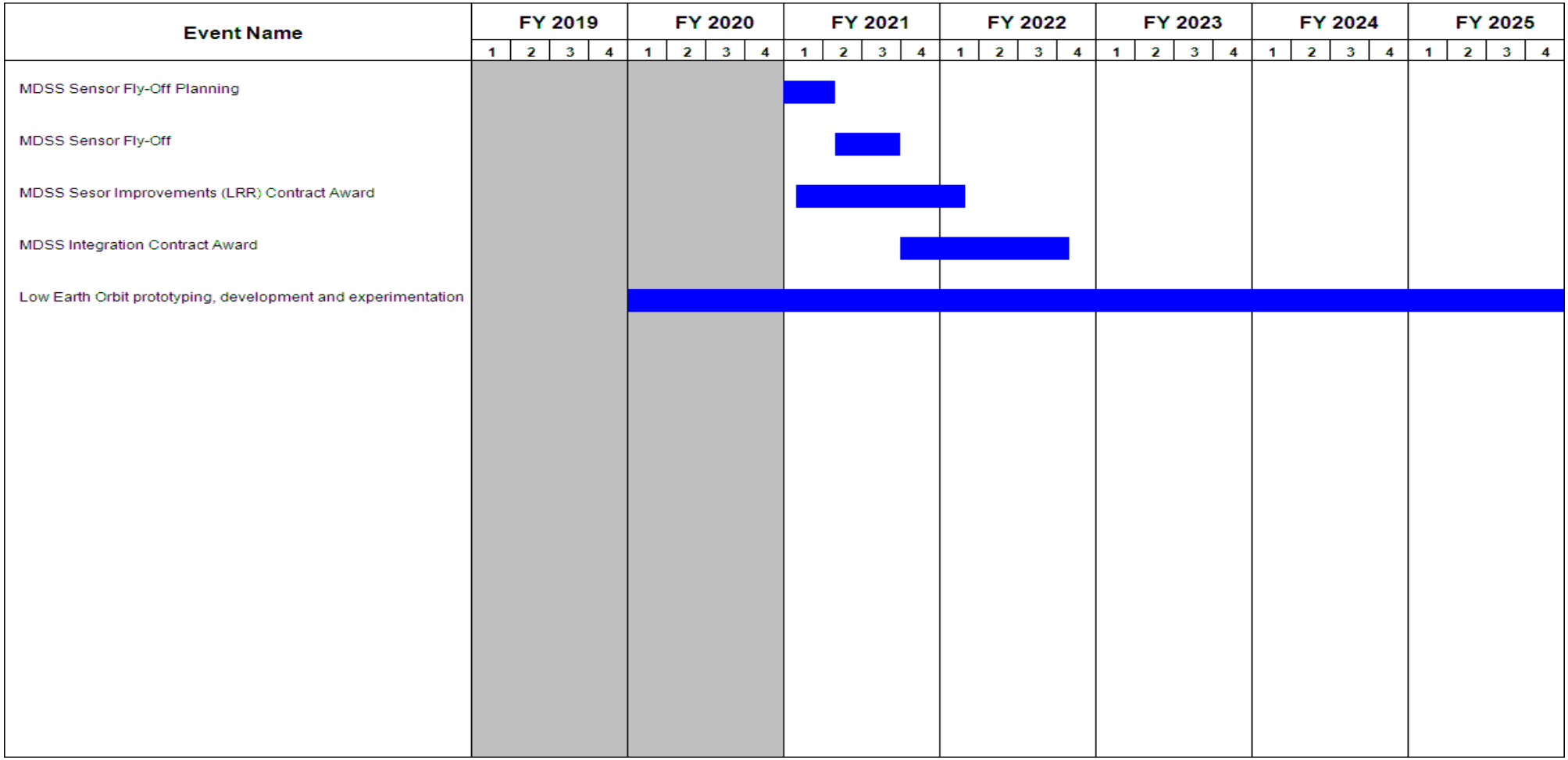

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603766A / *Tactical Electronic Surveillance System - Adv Dev*	**Project (Number/Name)** 907 / *Tactical Exploitation Of National Capabilities-MIP*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
CORE Cross-Agency Advanced Development and Engineering	1	2018	4	2025
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY20-24 POM	2	2018	2	2018
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY21-25 POM	2	2019	2	2019
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY22-26 POM	2	2020	2	2020
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY23-27 POM	2	2021	2	2021
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY24-28 POM	2	2022	2	2022
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY25-29 POM	2	2023	2	2023
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY26-30 POM	2	2024	2	2024
TITAN Space prototype system	1	2021	4	2025
ADV Advanced Development and Engineering	2	2015	4	2025
AMDAS Next Studies/Antenna Design/Development	1	2018	4	2023
AMDAS Next Ground Processor Development	2	2020	4	2023
Air Vigilance Advanced Development and System prototype efforts	3	2013	4	2025
TRFE Prototype Development and System Integration Efforts	1	2018	3	2023
MDSS Sensor Fly-Off Planning	1	2021	2	2021
MDSS Sensor Fly-Off	2	2021	3	2021
MDSS Sesor Improvements (LRR) Contract Award	1	2021	1	2022
MDSS Integration Contract Award	4	2021	4	2022
Low Earth Orbit prototyping, development and experimentation	1	2020	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603774A *I Night Vision Systems Advanced Development*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	7.072	200.791	24.316	-	24.316	22.282	16.958	72.311	34.349	Continuing	Continuing
BQ5: *Visual Augmentation System Advanced Development*	-	0.000	193.280	13.986	-	13.986	11.843	11.819	67.534	30.314	Continuing	Continuing
VT7: *Soldier Maneuver Sensors - Adv Dev*	-	7.072	6.028	7.565	-	7.565	7.675	3.141	2.779	2.037	Continuing	Continuing
VT8: *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*	-	0.000	1.483	2.765	-	2.765	2.764	1.998	1.998	1.998	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element focuses on efforts to evaluate and integrate technologies and representative prototype systems that facilitate the development of Soldier-borne sensor devices transitioning from the laboratory to operational use. Efforts focus on proving out commonality across as broad a spectrum of users as possible to provide enhanced Soldier products, giving them superiority on the battlefield.

Project BQ5 (Visual Augmentation System-Advanced Development) focuses on developing the next generation vision system that provides the Soldier with the ability to "fight, win and survive, day and night, in a multi-domain environment now and tomorrow". Funded efforts will accelerate the development of components, algorithms and demonstrations in support of the next generation day/night vision system. Provide Rapid Target Acquisition capability with the Family of Weapon Sights-Individual and next generation End User Device (EUD), to include advanced EUD applications. The focus is to integrate external data sources and advanced processed imagery with overlay data display. This project supports efforts to evaluate and integrate technologies and representative prototype systems for development of Soldier sensor devices, transitioning from the Science and Technology (S&T) stage to operational use. This project includes associated costs for efforts associated with integration and interface of products on the Soldiers' head, body, and weapon. This is a priority of the Secretary's Close Combat Lethality Task Force. Funding in this project aligns with the Army's priorities in support of the National Defense Strategy.

Project VT7 (Soldier Maneuver Sensors-Advanced Development) focuses on developing integrated and enhanced solutions that provide the Soldier with the ability to "fight, win and survive, day and night, in a multi- domain environment now and tomorrow". Products include maneuver capabilities to detect, recognize and identify targets, and to provide target acquisition capabilities to mitigate threats prior to being engaged. The integration of higher performing multi-spectral sensors with smart processing will provide adjusted weapon sight reticles and leverage network connectivity for improved situational awareness/understanding. Additional capabilities include signature management and resiliency across the electromagnetic spectrum, integration of a modular design structure for target acquisition applications including support for wireless data transfer passive range determination, and mitigation of manned and unmanned threat sensor systems. This project supports efforts to evaluate and integrate technologies and representative prototype systems for development of Soldier sensor devices transitioning from the Science and Technology (S&T) stage to operational use. This project includes costs for efforts associated with development, certification, verification and validation of interface products into the Adaptive

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603774A *I Night Vision Systems Advanced Development*

Squad Architecture (ASA). This project also includes development of tools and emulators of ASA components. Funding in this project aligns with Army's priorities in support of the National Defense Strategy.

Project VT8 (Soldier Precision Targeting Devices - Advanced Development) focuses on developing component technologies and representative prototype systems for Soldier portable precision targeting devices to continue improvements to system performance while reducing size, weight, and power required by those systems. Efforts will improve the Soldier's ability to precisely locate and designate targets across a broader range of operating environments, including all weather conditions and GPS-contested environments. Component technology development will precede integration into specific systems and will include improved Precision Azimuth and Vertical Angle Measurement (PAVAM) devices; solid-state, improved lasers for range finding/designation/marking; electro-optical sensors such as infrared, near-infrared, ultra-violet, and visible spectrum imagers; sensor and data fusion; laser designator spot detection and imaging; integration of advanced power management technologies. Funding in this project aligns with the Army's priorities in support of the National Defense Strategy.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	7.341	251.011	10.340	-	10.340
Current President's Budget	7.072	200.791	24.316	-	24.316
Total Adjustments	-0.269	-50.220	13.976	-	13.976
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-50.220			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.269	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	13.976	-	13.976

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) BQ5 / *Visual Augmentation System Advanced Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BQ5: *Visual Augmentation System Advanced Development*	-	0.000	193.280	13.986	-	13.986	11.843	11.819	67.534	30.314	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project focuses on developing the next generation vision system that provides the Soldier with the ability to "fight, win and survive, day and night, in a multi-domain environment now and tomorrow". Funded efforts will accelerate the development of components, algorithms and demonstrations in support of the next generation day/night vision system. Provide Rapid Target Acquisition capability with the Family of Weapon Sights-Individual and next generation End User Device (EUD), to include advanced EUD applications. The focus is to integrate external data sources and advanced processed imagery with overlay data display. This project supports efforts to evaluate and integrate technologies and representative prototype systems for development of Soldier sensor devices, transitioning from the Science and Technology (S&T) stage to operational use. This project includes costs for efforts associated with movement of information and high level processing, integration, and interface of products with the Soldiers' head, body, weapon, and transportation. This is a priority of the Secretary's Close Combat Lethality Task Force. Funding in this project aligns with the Army's priorities in support of the National Defense Strategy. This project supports the Soldier Lethality Cross Functional Team.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Heads Up Display (HUD)	-	184.503	13.986	-	13.986
Description: Integrated Visual Augmentation System (IVAS) HUD provides a first generation single platform for Soldier/Marines to fight, rehearse, and train in day and night that provides increased lethality, mobility, and situational awareness necessary to achieve overmatch against our current and future adversaries. ***FY 2020 Plans:*** Complete the development and technology improvements to IVAS. ***FY 2021 Base Plans:*** Develop technology improvements to the first generation IVAS system. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decreased from $193,280,000 in FY 2020 to $13,986,000 in FY 2021 due to the transition from rapid prototyping to rapid fielding. Major initial development efforts for the first generation IVAS are completed in FY 2020.					
Title: FY 2020 SBIR/STTR Transfer	-	8.777	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** BQ5 / *Visual Augmentation System Advanced Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638					
Accomplishments/Planned Programs Subtotals	-	193.280	13.986	-	13.986

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K36402: *IVAS/Heads Up Display*	-	-	906.045	-	906.045	1,045.688	319.670	-	148.426	Continuing	Continuing
• BQ6: *Visual Augmentation System Eng Dev*	-	63.200	8.991	-	8.991	4.995	8.108	8.125	70.754	Continuing	Continuing

Remarks

D. Acquisition Strategy

This project utilizes competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) BQ5 / *Visual Augmentation System Advanced Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		8.777		-		-		-	0.000	8.777	-
		Subtotal	-	-		8.777		-		-		-	0.000	8.777	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Heads Up Display (HUD)	Option/ TBD	Various : Various	-	-		179.426	Mar 2020	10.000	Nov 2020	-		10.000	0.000	189.426	-
		Subtotal	-	-		179.426		10.000		-		10.000	0.000	189.426	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Support	MIPR	NVESD : Fort Belvoir, Virginia 22060	-	-		5.077	Mar 2020	3.986	Nov 2020	-		3.986	0.000	9.063	-
		Subtotal	-	-		5.077		3.986		-		3.986	0.000	9.063	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		193.280		13.986		-		13.986	0.000	207.266	N/A

Remarks

In FY 2020 Management Services and Test and Evaluation Cost Category Items will be funded from PE 0604710A Night Vision Systems - Engineering Development project BQ6 Visual Augmentation System - Engineering Development.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** BQ5 / *Visual Augmentation System Advanced Development*

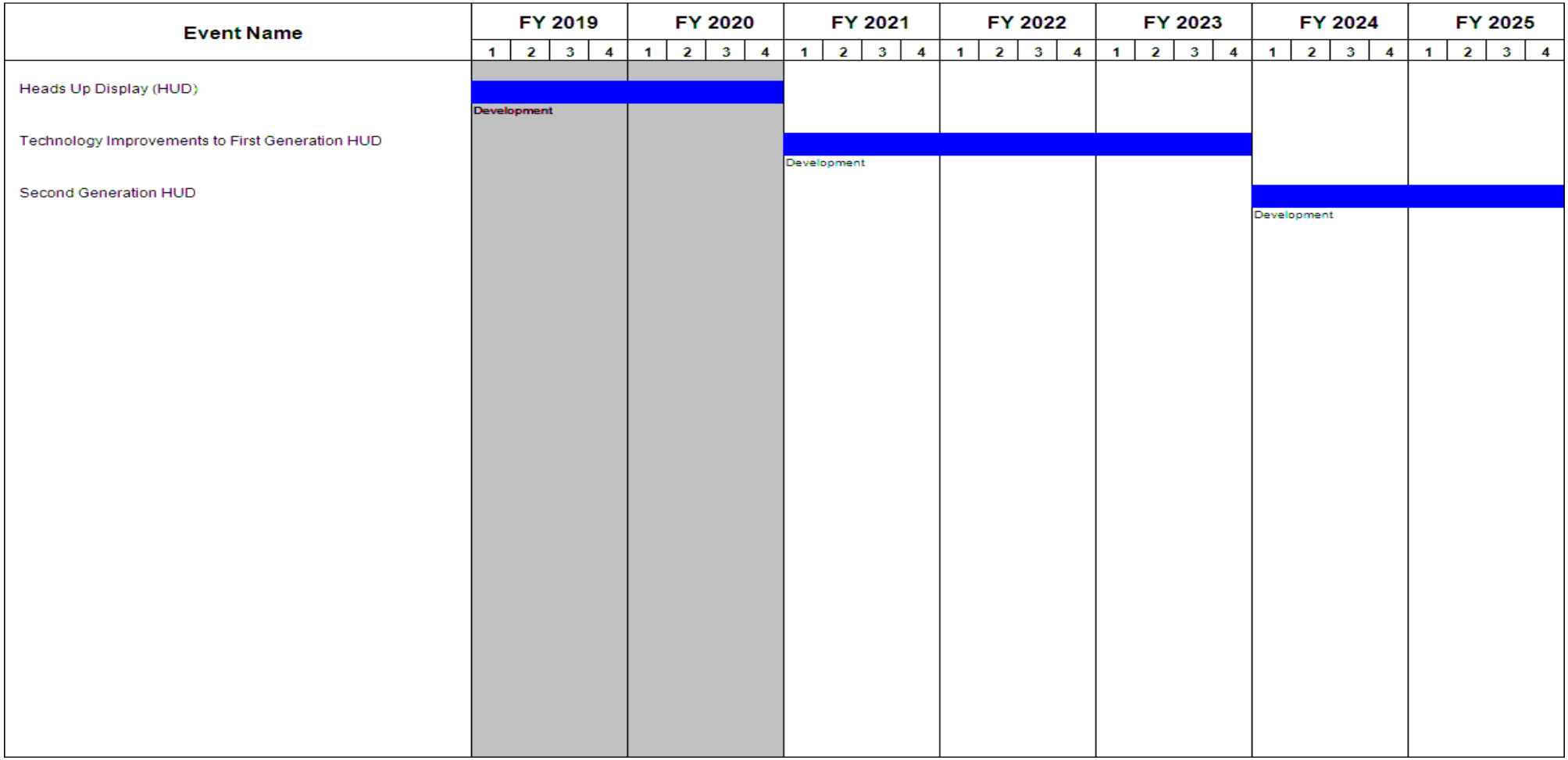

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** BQ5 / *Visual Augmentation System Advanced Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Heads Up Display (HUD)	4	2018	4	2020
Technology Improvements to First Generation HUD	1	2021	4	2023
Second Generation HUD	1	2024	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) VT7 / *Soldier Maneuver Sensors - Adv Dev*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VT7: *Soldier Maneuver Sensors - Adv Dev*	-	7.072	6.028	7.565	-	7.565	7.675	3.141	2.779	2.037	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project focuses on developing integrated and enhanced solutions that provide the Soldier with the ability to "fight, win and survive, day and night, in a multi- domain environment now and tomorrow". Products include maneuver capabilities to detect, recognize and identify targets, and to provide target acquisition capabilities to mitigate threats prior to being engaged. The integration of higher performing multi-spectral sensors with smart processing will provide adjusted weapon sight reticles and leverage network connectivity for improved situational awareness/understanding. Additional capabilities include signature management and resiliency across the electromagnetic spectrum, integration of a modular design structure for target acquisition applications including support for wireless data transfer passive range determination, and mitigation of manned and unmanned threat sensor systems. This project supports efforts to evaluate and integrate technologies and representative prototype systems for development of Soldier sensor devices transitioning from the Science and Technology (S&T) stage to operational use. This project includes costs for efforts associated with development, certification, verification and validation of interface products into the Adaptive Squad Architecture (ASA). This project also includes development of tools and emulators of ASA components. Funding in this project aligns with Army's priorities in support of the National Defense Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Soldier Enhanced Sensing Capabilities	5.803	1.912	1.490	-	1.490
Description: Soldier Enhanced Sensing Capabilities provides the next generation vision capabilities for day and night that will reduce the Soldier's burden and allow hands free operation. Soldier Enhanced Sensing Capabilities will provide automatic adjustment of imagery and matched sensor fields of view. This effort will provide day/night Rapid Target Acquisition (RTA) capability by interfacing with Family of Weapon Sights-Individual (FWS-I), day/night data display for the Soldier Network Warrior End User Device/Computer (EUD), and ability to send/receive data to the EUD to support advanced EUD applications to process the sensor video, integrate it with external data sources, and produced advanced processed imagery with overlay data display. This effort will consider Integrated Vision Augmentation System (IVAS) successes and explore an integrated digital, low profile, conformal day/night display. Prototyping will provide multiple knowledge point events to gauge vendor progress and capability to the force. This effort also includes continued digital Near-infrared (NIR) sensor development for potentially replace the aging fleet of Night Vision Devices.					
FY 2020 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
For FY 2020, in addition to continuing unfinished work initiated in FY 2019, integration and enhancements are expected in the Enhanced Night Vision Goggle-Binocular (ENVG-B) product line. ENVG-B furthers wireless Augmented Reality (AR) and Machine Learning (ML) into the goggle and incorporation of enhancements is anticipated. Work is continuing on a more robust, harder to detect and intercept wireless solution. Integration of this 256-bit encryption solution will be performed on all Soldier Maneuver and Precision Targeting programs of record in an effort to establish a Intra Soldier Wireless (ISW) network. In FY 2020, the ISW network will be documented (via ICDs) and available for use on any program that desires wireless connectivity with the ISW network. ***FY 2021 Base Plans:*** For FY 2021, in addition to continuing unfinished work initiated in FY 2020, integration and enhancements are expected in the Family of Weapon Sights and Small Tactical Optical Rifle Mounted programs of record. Migration from an Intra Soldier Wireless (ISW) 128-bit encryption to a 256-bit encryption solution and ultimately to an NSA certified 256-bit solution will be evaluated and appropriately acted upon for all Soldier Maneuver and Precision Targeting, ENVG-B employs Augmented Reality (AR) and Machine Learning (ML) capabilities. Investments are expected to solidify and enhance the supply of organic light emitting diodes for existing and emerging programs while work continues on advanced displays including waveguides and projection systems. Investments continue in multi-spectral devices that provide Soldiers capabilities beyond near peer adversaries. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 to FY 2021 slight decrease as component technologies have matured and synchronized with IVAS resources					
Title: Target Acquisition Laser Capabilities	1.269	2.272	2.701	-	2.701
Description: Target Acquisition Laser Capabilities develops modular laser components and representative prototype systems to support target acquisition for pointing, ranging, target hand-off, detection and mitigation of threat sensors. This effort will develop a common laser range finding core for fire control and other laser capabilities based on Squad member Table of Organization and Equipment (TOE) position. Modules will be developed with full documentation, including specifications and interface control documents such that they support the Adaptive Soldier Architecture. This effort develops target handoff capabilities that are less detectable moving towards a covert target handoff, pointing and range finding capability. This effort also includes individual Soldier laser event recording and laser warning devices. ***FY 2020 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Continue development and integration of modular target acquisition laser components. ***FY 2021 Base Plans:*** For FY 2021, resources will be used for development of modular laser components and prototype devices that leverage interface control documents and the Adaptive Squad Architecture. Integration of interfaces such as Intra-Soldier Wireless and an Intelligent/Powered Rail will support a modular system-of-systems approach for target acquisition, pointing, ranging, and target hand-off. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 to FY 2021 increase in required funding as laser capabilities are integrated into Advanced Sensor Development.					
Title: Advanced Sensor Development ***Description:*** Advanced Sensor Development is the next generation weapon target acquisition system for use on Next Generation Squad Weapons (NGSW). The increased Advanced Sensor Development all digital capabilities include: wireless remote weapon sight viewing compatibility with the emerging goggle solutions (Enhanced Night Vision Goggle - Binocular (ENVG-B) and Integrated Vision Augmentation System (IVAS)) to provide a heads up Rapid Target Acquisition (RTA) capability; wireless interface with the future Soldier processing component to exchange Mission Command information; day and night capabilities to image in multiple spectral bands; target interrogation; laser range finding; target handoff with coded sources; adjusted and displaced reticule; and facial recognition capabilities at tactical ranges. ***FY 2020 Plans:*** FY 2020 should complete the development of laser components including the "ATOM" Short Wave Infra-Red (SWIR) laser that is planned for incorporation into the Advanced Sensor Development. The ATOM lasers primarily used for aiming, target handoff, target illumination and ranging. ***FY 2021 Base Plans:*** Plans to integrate advanced capabilities, employ system engineering principals in support of the Adaptive Squad Architecture and refine capability emergence from lab to Program Management responsibility. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 to FY 2021 increase in required funding as IVAS matured some component technology ahead of schedule.	-	1.571	2.734	-	2.734
Title: Adaptive Squad Architecture (ASA) Tools	-	-	0.640	-	0.640

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: This project contains tools and services that support the Adaptive Squad Architecture (ASA) integration effort. This project considers emerging products as well as legacy products for size, weight and power efficiencies. This project develops interface control documentation for integration into the ASA, Next Gen Squad Weapon power / intelligent rail and enables upgrades, enhancements, certifications, validation , verification of evolving Intra-Soldier Wireless products. ASA will pursue a common weapon remote to operate all weapon enablers. ***FY 2021 Base Plans:*** Strategically plan for Soldier Integration Faciltiy and ASA support, NGSW integration and ISW growth. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The ASA is established to identify and capture resources required for enduring support to the ASA mission.					
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	0.273	-	-	-
Accomplishments/Planned Programs Subtotals	7.072	6.028	7.565	-	7.565

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• L67: *Soldier Night Vision Devices*	56.793	35.060	14.653	-	14.653	9.231	12.519	17.161	17.163	Continuing	Continuing
• K36400: *Helmet Mounted Enhanced Vision Devices*	112.251	50.632	207.626	-	207.626	245.012	6.436	318.684	-	Continuing	Continuing
• K22002: *FWS-INDIVIDUAL*	90.932	81.541	99.160	-	99.160	61.858	71.526	77.718	84.792	Continuing	Continuing
• K22003: *FWS-CREW SERVED*	22.698	-	31.861	-	31.861	78.066	78.193	77.228	64.934	Continuing	Continuing
• K22004: *FWS-SNIPER*	-	-	2.569	-	2.569	11.336	18.843	19.767	11.489	Continuing	Continuing
• B53800: *Laser Target Locator Systems*	32.704	24.354	13.704	0.643	14.347	20.817	23.752	21.663	49.820	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*	

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K35110: *Small Tactical Optical Rifle Mounted MLRF*	16.990	22.623	13.954	-	13.954	21.355	26.060	29.315	3.131	Continuing	Continuing
• K36402: *IVAS/Heads Up Display*	-	-	906.045	-	906.045	1,045.688	319.670	-	148.426	Continuing	Continuing
• BQ5: *Visual Augmentation System Advanced Development*	-	193.280	13.986	-	13.986	11.843	11.819	67.534	30.314	Continuing	Continuing
• BQ6: *Visual Augmentation System Eng Dev*	-	63.200	8.991	-	8.991	4.995	8.108	8.125	70.754	Continuing	Continuing

Remarks

D. Acquisition Strategy

The various developmental programs in this Project continue to exercise competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) VT7 / *Soldier Maneuver Sensors - Adv Dev*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	Various : Various	-	0.406	Nov 2018	0.556	Dec 2019	0.394	Nov 2020	-		0.394	Continuing	Continuing	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.273		-		-		-	0.000	0.273	-
		Subtotal	-	0.406		0.829		0.394		-		0.394	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Soldier Enhanced Sensing Capabilities	MIPR	NVESD : FT BELVOIR, VA	-	5.262	Dec 2018	1.949	Feb 2020	1.490	Nov 2020	-		1.490	Continuing	Continuing	-
Target Acquisition Laser Capabilities	MIPR	NVESD : FT BELVOIR, VA	-	1.023	Jan 2019	2.309	Jan 2020	2.353	Nov 2020	-		2.353	Continuing	Continuing	-
Advanced Sensor Development	TBD	TBD : TBD	-	-		0.336	Feb 2020	2.040	Nov 2020	-		2.040	Continuing	Continuing	-
Adaptive Squad Architecture (ASA) Tools	TBD	TBD : TBD	-	-		-		0.640	Nov 2020	-		0.640	Continuing	Continuing	-
		Subtotal	-	6.285		4.594		6.523		-		6.523	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Support	MIPR	NVESD : FT BELVOIR, VA	-	0.381	Nov 2018	0.605	Jan 2020	0.648	Nov 2020	-		0.648	Continuing	Continuing	-
		Subtotal	-	0.381		0.605		0.648		-		0.648	Continuing	Continuing	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	7.072		6.028		7.565		-		7.565	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) VT7 / *Soldier Maneuver Sensors - Adv Dev*	

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*

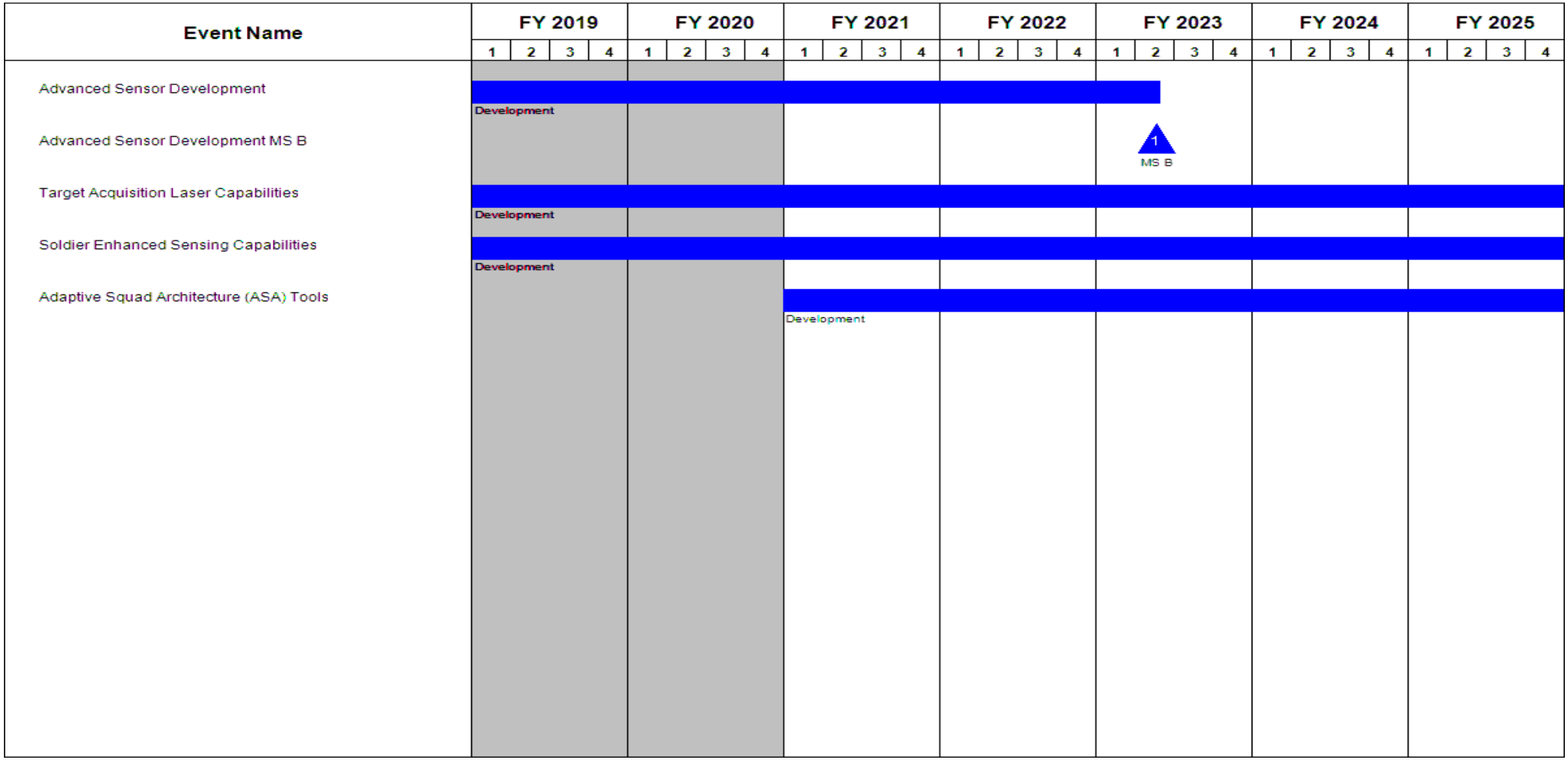

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT7 / *Soldier Maneuver Sensors - Adv Dev*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Advanced Sensor Development	1	2019	2	2023
Advanced Sensor Development MS B	2	2023	2	2023
Target Acquisition Laser Capabilities	1	2019	4	2025
Soldier Enhanced Sensing Capabilities	1	2019	4	2025
Adaptive Squad Architecture (ASA) Tools	1	2021	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) VT8 / *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VT8: *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*	-	0.000	1.483	2.765	-	2.765	2.764	1.998	1.998	1.998	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project focuses on developing component technologies and representative prototype systems for Soldier portable precision targeting devices to continue improvements to system performance while reducing size, weight, and power required by those systems. Efforts will improve the Soldier's ability to precisely locate and designate targets across a broader range of operating environments, including all weather conditions and GPS-contested environments. Component technology development will precede integration into specific systems and will include improved Precision Azimuth and Vertical Angle Measurement (PAVAM) devices; solid-state, improved lasers for range finding/designation/marking; electro-optical sensors such as infrared, near-infrared, ultra-violet, and visible spectrum imagers; sensor and data fusion; laser designator spot detection and imaging; integration of advanced power management technologies. Funding in this project aligns with Army's priorities in support of the National Defense Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Precision Pointing and Navigation Component Development	-	1.416	2.765	-	2.765
Description: This project supports development of advanced components and prototype systems for Soldier-borne precision targeting devices. Dismounted Soldiers will have the capability to rapidly acquire, accurately locate, positively identify, and precisely designate targets and battlefield threats 24/7, across a broader range of operating environments such as in all weather conditions, and in GPS-contested conditions.					
FY 2020 Plans: FY 2020 resources will be used to integrate Intra-Soldier Wireless capabilities into Soldier Precision Targeting Devices (SPTD) Fires portfolio. In addition, as the Army begins to introduce M-Code, the more robust north finding solution will be integrated into the Fires SPTD products.					
FY 2021 Base Plans: FY 2021 resources will be used for development of component technologies and initial sub-system integration for Precision Azimuth and Vertical Angle Measurement (PAVAM) devices with reduced size, weight, and power. Additionally, FY 2021 resources will continue integration of M-Code into Dismounted Fires systems to improve operational capabilities in a GPS-contested environment.					
FY 2020 to FY 2021 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT8 / *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 to FY 2021 increase in required funding to provide GPS denied capability.					
Title: FY 2020 SBIR/STTR Transfer	-	0.067	-	-	-
Description: Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638					
Accomplishments/Planned Programs Subtotals	-	1.483	2.765	-	2.765

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• L76: *Dismounted Fire Support Laser Targeting Systems*	14.761	-	0.000	-	0.000	-	-	-	-	0.000	14.761
• L79: *Joint Effects Targeting Systems (JETS)*	10.080	6.410	5.566	-	5.566	5.603	5.035	5.604	6.004	0.000	44.302
• K32101: *JOINT EFFECTS TARGETING SYSTEM (JETS)*	66.574	25.330	69.641	-	69.641	67.932	69.629	69.624	69.623	0.000	438.353
• KA3100: *Mod Of In-Svc Equip (LLDR)*	24.833	6.044	0.000	-	0.000	-	-	-	-	0.000	30.877

Remarks

D. Acquisition Strategy

The various developmental programs in this project continue to exercise competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / *Night Vision Systems Advanced Development*	Project (Number/Name) VT8 / *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	PM SSL : Ft. Belvoir, VA 22060	-	-		0.023	Jan 2020	0.023	Nov 2020	-		0.023	Continuing	Continuing	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.067		-		-		-	0.000	0.067	-
		Subtotal	-	-		0.090		0.023		-		0.023	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Precision Pointing and Navigation	C/FFP	Various : Various	-	-		1.372	Feb 2020	2.715	Dec 2020	-		2.715	Continuing	Continuing	-
		Subtotal	-	-		1.372		2.715		-		2.715	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Support	MIPR	NVESD : Ft. Belvoir, VA 22060	-	-		0.021	Jan 2020	0.027	Nov 2020	-		0.027	Continuing	Continuing	-
		Subtotal	-	-		0.021		0.027		-		0.027	Continuing	Continuing	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		1.483		2.765		-		2.765	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT8 / *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*

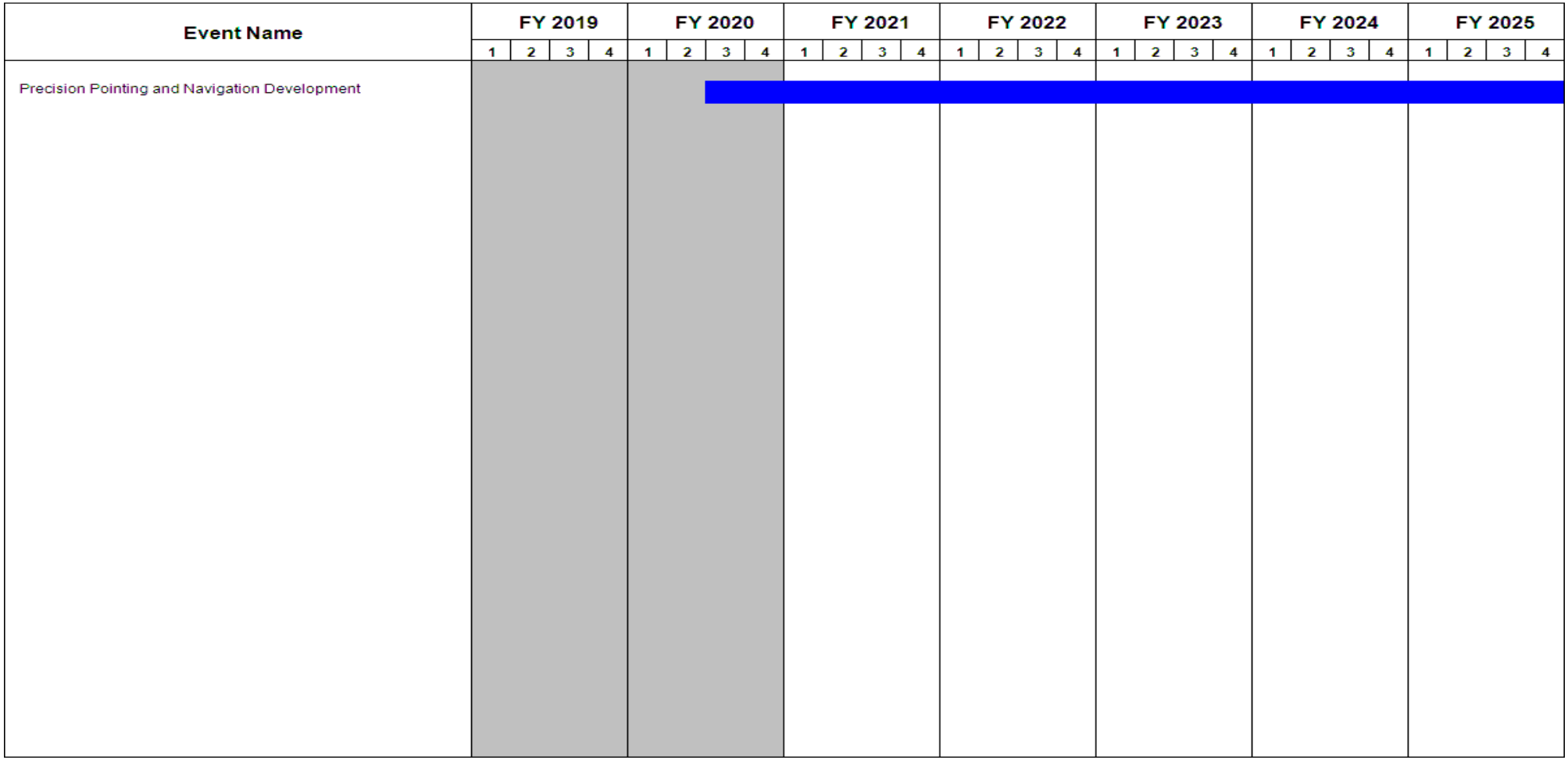

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603774A / *Night Vision Systems Advanced Development*	**Project (Number/Name)** VT8 / *SOLDIER PRECISION TARGETING DEVICES - ADV DEV*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Precision Pointing and Navigation Development	3	2020	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	14.190	19.561	13.387	-	13.387	12.166	13.490	10.950	10.772	0.000	94.516
035: *National Defense Cntr For Enviro Excellence*	-	4.685	6.484	5.272	-	5.272	5.374	6.508	6.644	6.712	0.000	41.679
E21: *Environmental Quality Technology Dem/Val*	-	9.505	13.077	8.115	-	8.115	6.792	6.982	4.306	4.060	0.000	52.837

A. Mission Description and Budget Item Justification

There is broad potential application for environmental quality technology (EQT) to be applied to multiple Army weapon systems and installations. However, technology must be demonstrated and validated (total ownership cost and performance data identified) before potential users will consider exploiting it. This Program Element (PE) includes Projects focused on validating the general military utility or cost reduction potential of technology when applied to different types of infrastructure, military equipment or techniques. It may include validations and proof-of-principle demonstrations in field exercises to evaluate upgrades or provide new operational capabilities. The validation of technologies will be in as realistic an operating environment as possible to assess performance or cost reduction potential. EQT demonstration/ validation is systemic and applicable across Department of Army sites and installation problems (e.g. unexploded ordnance detection and discrimination). This PE supports the Army's top modernization priorities by addressing potential obsolescence of legacy materials and current and emerging impacts on human health and the environment. All work is endorsed by potential users and supported by a state-of-the-art assessment to determine when the technology can transition to the user for implementation.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	14.731	15.132	16.263	-	16.263
Current President's Budget	14.190	19.561	13.387	-	13.387
Total Adjustments	-0.541	4.429	-2.876	-	-2.876
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-3.571			
• Congressional Rescissions	-	-			
• Congressional Adds	-	8.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.541	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-2.876	-	-2.876

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: 035: *National Defense Cntr For Enviro Excellence*		

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603779A *I Environmental Quality Technology - Dem/Val*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Congressional Add: *Program increase - biopolymers for military infrastructure*	-	3.000
Congressional Add Subtotals for Project: 035	-	3.000
Project: E21: *Environmental Quality Technology Dem/Val*		
Congressional Add: *Environmental quality technology demonstration and validation: Congressional Add - Protective Coatings/ Biopolymers*	-	5.000
Congressional Add Subtotals for Project: E21	-	5.000
Congressional Add Totals for all Projects	-	8.000

Change Summary Explanation

FY 2021 funding decrease is due to a realignment to Army Modernization Priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / *Environmental Quality Technology - Dem/Val*	Project (Number/Name) 035 / *National Defense Cntr For Enviro Excellence*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
035: *National Defense Cntr For Enviro Excellence*	-	4.685	6.484	5.272	-	5.272	5.374	6.508	6.644	6.712	0.000	41.679
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The National Defense Center for Environmental Excellence (NDCEE) was established by Congress in 1990 with a directive to "serve as a national leadership organization to address high priority environmental problems for the Department of Defense (DoD), other government organizations, and the industrial community." The NDCEE Program is a national resource for developing and disseminating advanced environmental technologies. The NDCEE is used to: demonstrate environmentally acceptable technology to industry; validate new technology prior to transferring that technology; and assist in the training of potential users as part of that technology transfer process. The NDCEE is a DoD resource for environmental quality management and technology validation. This Project is managed by the Army on behalf of the Assistant Secretary of Defense for Sustainment. In May 2008, the Project name was re-designated from the National Defense Center for Environmental Excellence to the National Defense Center for Energy and Environment to ensure that the Center's mission recognizes and addresses the strategic interdependence of energy and environmental technology requirements within an overall sustainability framework in support of our installations, weapons systems and war fighters. This name change also directly supports the DoD's proactive implementation of Executive Order 13423, "Strengthening Federal Environmental, Energy and Transportation Management."

The United States (U.S.) Army's broadly encompassing and growing mobile, personal and stationary advanced energy technology requirements include infrastructure, alternative and synthetic fuels, surety, renewables, storage, distribution, advanced power, micro-grids, transportation, systems integration and others. Further, to train as we fight, validated energy and environmental technologies need to be available and implemented at Army installations. The NDCEE will continue to demonstrate, validate, and transfer these technologies supporting our integrated environment, safety, occupational health and energy objectives in consideration of mission, readiness, innovation, lethality and modernization.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Conduct demonstration/validation of environmentally acceptable technologies that enhance military readiness and reduce production, operating, and/or disposal costs.	4.495	3.212	5.072
Description: Supports the demonstration and validation of mature (BA4) environment, safety, occupational health, and energy technologies that support the Army's Environmental Quality Technology mission. The objective is to invest in innovative technologies that support military mission/readiness, employ a high degree of technical fidelity, have a high potential for transition success, and align with modernization goals.			
FY 2020 Plans: Will conduct demonstration/validation of environment, safety, occupational health, and energy technologies that support military mission/readiness, employ a high degree of technical fidelity, have a high potential for transition success, and align with			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** 035 / *National Defense Cntr For Enviro Excellence*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
modernization goals. Will conduct project selection process for potential FY 2021 new starts. Technologies will be selected by the NDCEE project selection committee and approved by the NDCEE Lead Agent. ***FY 2021 Plans:*** Will conduct demonstration/validation of environment, safety, occupational health, and energy technologies that support military mission/readiness, employ a high degree of technical fidelity, have a high potential for transition success, and align with modernization goals. Will conduct project selection process for potential FY 2022 new starts. Technologies will be selected by the NDCEE project selection committee and approved by the NDCEE Lead Agent. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase is due to programmatic economic factors and success of FY19 projects and increased recognition and value of the program.			
Title: NDCEE Government program management during contract negotiations and during project formulation, execution, and technology transfer. ***Description:*** Funds the NDCEE Government program management during comprehensive NDCEE lifecycle, including project cultivation and identification, screening, selection, execution, and technology transition. ***FY 2020 Plans:*** Will fund the NDCEE program management during comprehensive NDCEE lifecycle, including project cultivation and identification, screening, selection, execution, reporting, and technology transfer. Includes contracting office support for contract closeouts, travel to conduct program management oversight, and program coordination and education to DoD stakeholders. ***FY 2021 Plans:*** Will fund the NDCEE program management during comprehensive NDCEE lifecycle, including project cultivation and identification, screening, selection, execution, reporting, and technology transfer. Includes contracting office support for contract closeouts, travel to conduct program management oversight, and program coordination and education to DoD stakeholders. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Programmatic Economic Factors.	0.190	0.119	0.200
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:***	-	0.153	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** 035 / *National Defense Cntr For Enviro Excellence*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC 638			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC 638			
Accomplishments/Planned Programs Subtotals	4.685	3.484	5.272

	FY 2019	FY 2020
Congressional Add: Program increase - biopolymers for military infrastructure	-	3.000
FY 2020 Plans: Program increase - biopolymers for military infrastructure		
Congressional Adds Subtotals	-	3.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The NDCEE is a national asset focused on DoD applications that include technology transfer to appropriate DoD transition partners. The management strategy for the NDCEE ensures that all projects have a potential multi-service benefit and have a high potential for transition success. At the strategic level, the NDCEE Executive Advisory Board (EAB) is chaired by the DoD NDCEE Lead Agent on behalf of the Assistant Secretary of Defense for Sustainment and is representative of the services and DoD. The EAB and the Program Director are supported by the NDCEE Technical Advisory Group (TAG) to help ensure that NDCEE investments are maximized across DoD and the Services. At the tactical level, the three Focus Groups (environment, safety/occupational health, and energy) cultivate and recommend priority projects to the TAG and Project Selection Committee for funding. Transition Partners ensure that NDCEE's investments are carried forward in the next phases of the Research Development Test and Evaluation process, as identified in each funded project's Technology Transition Agreement.

NDCEE projects enable readiness for the Services under increasingly complex and demanding scenarios. The interdependency of national security with energy supply and costs, water supply and costs, environmental resiliency, and human health and safety are clear and NDCEE projects provide forward-looking solutions to these challenges. Failure to further fund and validate promising technologies that are at the mature or Commercial-off-the-Shelf stage, would result in lost modernization opportunities and validation before they go into a military environment. These initiatives need to be carried forward into an operational/realistic testing environment so that they can support mission readiness and training when ultimately fielded to the Services.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / *Environmental Quality Technology - Dem/Val*	Project (Number/Name) 035 / *National Defense Cntr For Enviro Excellence*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	MIPR	AEC : San Antonio, TX	24.916	0.190	Nov 2018	0.119	Nov 2018	0.200	Nov 2018	-		0.200	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.153		-		-		-	0.000	0.153	-
		Subtotal	24.916	0.190		0.272		0.200		-		0.200	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Testing and Evaluation	Various	Various. : Various	35.624	4.495	Nov 2018	6.212	Nov 2018	5.072	Nov 2018	-		5.072	Continuing	Continuing	Continuing
		Subtotal	35.624	4.495		6.212		5.072		-		5.072	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	60.540	4.685		6.484		5.272		-		5.272	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** 035 / *National Defense Cntr For Enviro Excellence*

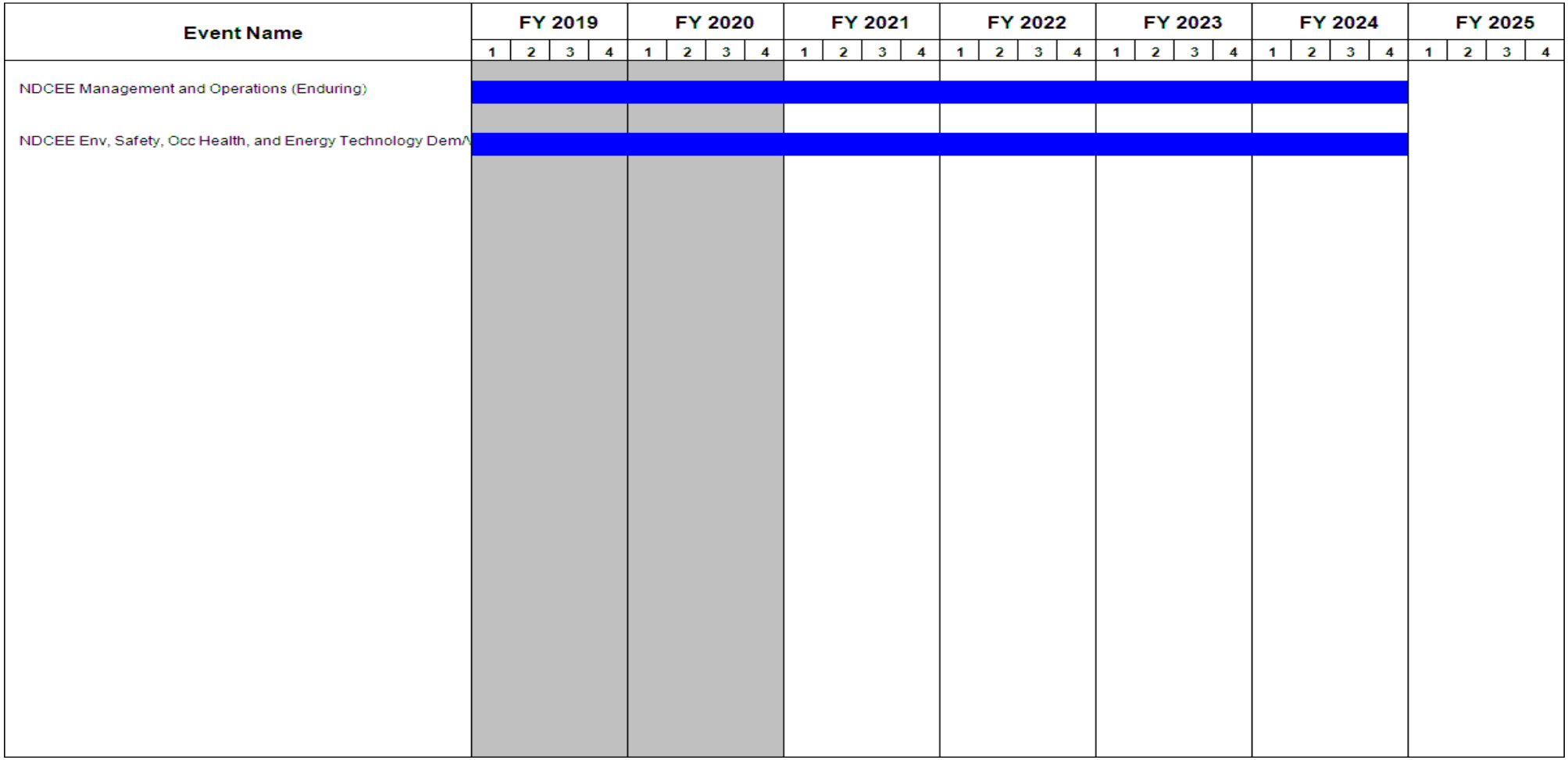

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** 035 / *National Defense Cntr For Enviro Excellence*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
NDCEE Management and Operations (Enduring)	1	2019	4	2024
NDCEE Env, Safety, Occ Health, and Energy Technology Dem/Val (Enduring)	1	2019	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / *Environmental Quality Technology - Dem/Val*	Project (Number/Name) E21 / *Environmental Quality Technology Dem/Val*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
E21: *Environmental Quality Technology Dem/Val*	-	9.505	13.077	8.115	-	8.115	6.792	6.982	4.306	4.060	0.000	52.837
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project supports Advanced Component Development and Prototypes of innovative environmental quality technologies that modernize materials and processes required for current and future operational sustainment and warfighter training capabilities. The Project showcases technologies that increase life safety, reduce Soldier and worker human health risks, enhance readiness and enable mission capabilities of the current and future force with a focus on eliminating the high priority issues associated with hexavalent chromium, cadmium and airborne lead through material substitution. The Project expedites technology transition from the laboratory to operational use by demonstrating modern materials and processes to fulfill or surpass the performance requirements outlined in Material Specifications, Depot Maintenance Work Requirements, Technical Manuals, Drawings and other technical data. Forward-looking materials and processes demonstrated under this project support the Cross Functional Teams and the Army's top modernization priorities by addressing potential obsolescence of legacy materials and current and emerging impacts on human health and the environment. Modernized materials and processes have the additional benefit of reducing future regulatory compliance and cleanup requirements while simultaneously increasing performance and standardization across the Army, resulting in significantly reduced life cycle costs incurred by acquisition, industrial base and installation end users.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Environmental quality technology demonstration and validation: Toxic Metal Reduction in Surface Finishing of Army Weapon Systems (CCDC)	2.954	2.173	3.154
Description: Increase operational readiness and reduce Soldier and worker human health risks by reducing or eliminating the use of cancer-causing hexavalent chromium, cadmium and associated toxic materials used in surface finishing processes for the current and future force. These surface coating technologies will be used to provide superior corrosion and wear protection for components used on Future Vertical Lift and Next Generation Combat Vehicles and enable increased performance/extended barrel life for Long Range Precision Fire systems.			
FY 2020 Plans: Will demonstrate zinc-nickel alternatives to cadmium for use on fasteners, electrical connectors and in brush plating; will qualify portable cold spray system and trivalent chromium electroplating as hard chrome alternatives.			
FY 2021 Plans: Will complete demonstration of cold spray gun barrels with increased barrel life; will validate hexavalent chromium-free aluminum anodizing process at pilot scale and demonstrate on relevant aircraft.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Economic adjustment			
Title: Environmental quality technology demonstration and validation: Airborne Lead Reduction from Army Weapon Systems (CCDC) ***Description:*** Sustain Soldier training readiness, maintain/restore training capability at ranges closed due to dangerous levels of lead exposure and increase life safety and protection of human health on Army installations by reducing or eliminating the use of toxic lead compounds ? which are known to cause damage to central nervous, cardiovascular and immune systems with long-term effects for children, as well as potential developmental impacts, including IQ loss, behavioral issues and hearing loss - in rocket and missile propellants and primary explosives (primers/detonators/initiators) for the current and future force. These lead-free formulations will provide a domestic, readily available source for primary explosives used in all Long Range Precision Fires and Soldier Lethality systems. ***FY 2020 Plans:*** Will demonstrate lead-free primer in small/medium caliber ammunition; will complete flight weight demonstration of reduced-lead double-base propellants for Hydra rockets. ***FY 2021 Plans:*** Will demonstrate lead-free fuze (combining primer and detonator) in hand grenade configuration; will demonstrate lead-free minimum signature rocket propellants in heavy-weight motors. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY20 decrease aligns program requirements with Army modernization priorities.	1.837	1.659	2.232
Title: Environmental quality technology demonstration and validation: Low Global Warming Potential (LGWP) Alternatives to Ozone Depleting Substances (ODS) (CCDC) ***Description:*** Evaluate low GWP ODS alternatives being developed by industry to assess their toxicity and flammability hazards and verify their acceptability in military unique refrigeration and fire suppression applications, including Future Vertical Lift and Next Generation Combat Vehicle. ***FY 2020 Plans:*** Will validate and promulgate the demonstrated refrigerant flammability test method. ***FY 2021 Plans:*** Will conduct vehicle-scale demonstrations for alternative, low GWP extinguishing agents with high potential to meet safety and performance requirements for occupied crew compartments. ***FY 2020 to FY 2021 Increase/Decrease Statement:***	0.250	0.191	0.226

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Economic adjustment.			
Title: Environmental quality technology demonstration and validation: ESOH Impacts of Short-Term Noise Assessment Procedures (USACE) ***Description:*** Demonstrate and validate the technologies, including the underlying computational algorithms, for the impact of short-term noise assessment procedures on environmental footprint and Soldier readiness. When completed the program will: 1) have validated short-term noise assessment procedures, including uncertainty metrics and 2) have on-line, self-guided training modules for Sustainable Range Program range officers on performing and interpreting short-term noise assessment results.	0.250	-	-
Title: Environmental quality technology demonstration and validation: Insensitive Munitions (IM) Wastewater Treatment (USACE) ***Description:*** Demonstrate and validate optimized scalable wastewater treatment system basic technology for the destructive treatment of existing and emerging insensitive munitions (IM) contaminated production wastewater generated during Army ammunition plant munitions production. ***FY 2020 Plans:*** Will continue operation of Fenton oxidation pilot demonstration system at MCAAP with ramp up to 500 gpd total capacity. Will adjust operations and perform manufacturing trials to optimize treatment. Will document cost savings for Fenton oxidation of IM wastewaters. Will install pilot demonstration unit for continuous precipitation and membrane concentration of IM wastewaters at MCAAP. ***FY 2021 Plans:*** Will install pilot demonstration unit for continuous precipitation and membrane concentration of IM wastewaters at MCAAP. Will work with local authorities to verify release limits and treatment optimization. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Economic adjustment.	1.681	1.604	0.905
Title: Environmental quality technology demonstration and validation: Environmental Toolkit for Expeditionary Operations (USACE) ***Description:*** Conduct pilot-scale demonstration and validation studies to determine the effectiveness of basic technologies/ methods developed for rapidly collecting environmental data in the field for the purposes of reducing impact of environmental requirements on installations. Demonstrate the ability of ETEO software to communicate easily with new, commercially available sensors through simple device driver (with minimal or no development). Assess available chemical databases on the new sensor for their ability to detect and quantify environmental contaminants. Demonstrate the operational ETEO software and sensors at designated locations.	1.275	0.794	0.505

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Will demonstrate software and sensors package for environmental baseline evaluation capabilities with engineer soldiers. Perform demonstration of ETEO at an ARMY installation with Directorate of Public Works; Directorate of Plans, Training, Mobilization, and Security; and Directorate of Emergency Services on developed platform and prepare a technical/functional assessment report. During this phase, a two-day field demonstration will be conducted. The demonstration will be conducted to test the installation?s ability to detect the presence of environmental contaminants in soils with the sensor suite to transfer that data into an EBS using ETEO software and to quickly understand the resulting information and its implication to operations. ***FY 2021 Plans:*** Will develop instructional videos for all current ETEO tools and software to streamline training use of ETEO for current and future users. Test and demonstrate a new sensor as a potential replacement for the PET kit. Reduce the amount of consumables in the ETEO toolkit. Will demonstrate new auto-fill capabilities in the reporting software to decrease Soldiers time populating Environmental Baseline Surveys. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Economic adjustment.			
Title: Environmental quality technology demonstration and validation: Fate and Risk Evaluation System for Contaminants (FRESCO?) ***Description:*** FRESCO? will ensure Solider readiness through reduction in training range down time. Validation of FRESCO? will provide the capability to model and forecast contaminant fate and health risks associated with new military materials in the environment, pursuant to unfilled technology gap identified in DoD Instruction Number 4715.18. ***FY 2020 Plans:*** 1) Will finalize integration of upgraded existing components, perform testing and debugging ? existing component integration and testing will be finalized in FY20. 2) Will add new capabilities to FRESCO?, perform testing and debugging ? since the development of ARAMS? and TREECS?, new fate and transport models and databases have been developed. Soils Model, Vadose Zone Model, and Channel Model will be upgraded to give greater support in evaluating the fate and transport of EC. 3) Will validate FRESCO? System using existing army data ? the project team will work with our Technology Transition Agreement (TTA) partners to select an applicable demonstration site that will allow us to demonstration and validate the full system features. ***FY 2021 Plans:*** Validation of FRESCO will provide the capability to model and forecast contaminant fate and health risks associated with new military materials in the environment, pursuant to unfilled technology gap identified in DoD Instruction Number 4715.18.The	1.258	1.469	1.093

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FRESCO System will be further validated using existing Army data - the project team will work with our Technology Transition Agreement (TTA) partners to select an applicable demonstration site that will allow us to demonstration and validate the full system features. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change due to economic adjustment.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	0.187	-
Accomplishments/Planned Programs Subtotals	9.505	8.077	8.115

	FY 2019	FY 2020
Congressional Add: Environmental quality technology demonstration and validation: Congressional Add - Protective Coatings/Biopolymers ***FY 2020 Plans:*** Environmental quality technology demonstration and validation: Congressional Add - Protective Coatings/Biopolymers	-	5.000
Congressional Adds Subtotals	-	5.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 06I: *Environmental Quality Technology Support*	0.921	0.562	0.444	-	0.444	0.450	0.480	0.298	0.130	0.000	3.285

Remarks

D. Acquisition Strategy

The project ultimately transitions successfully demonstrated environmental quality technologies to Army acquisition, industrial base and installation end users. All technology efforts address a valid Army Environmental Requirements and Technology Assessments (AERTA) requirement. Efforts approved by senior Army

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

environmental leadership receive Advanced Component Development and Prototype funding to fully demonstrate and validate the technology for transition to end users for follow on implementation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.187		-		-		-	0.000	0.187	-
		Subtotal	-	-		0.187		-		-		-	0.000	0.187	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Conduct Demonstrations	MIPR	Varies : Varies	27.292	9.505	Oct 2018	12.890	Oct 2019	8.115	Oct 2020	-		8.115	Continuing	Continuing	Continuing
		Subtotal	27.292	9.505		12.890		8.115		-		8.115	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	27.292	9.505		13.077		8.115		-		8.115	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

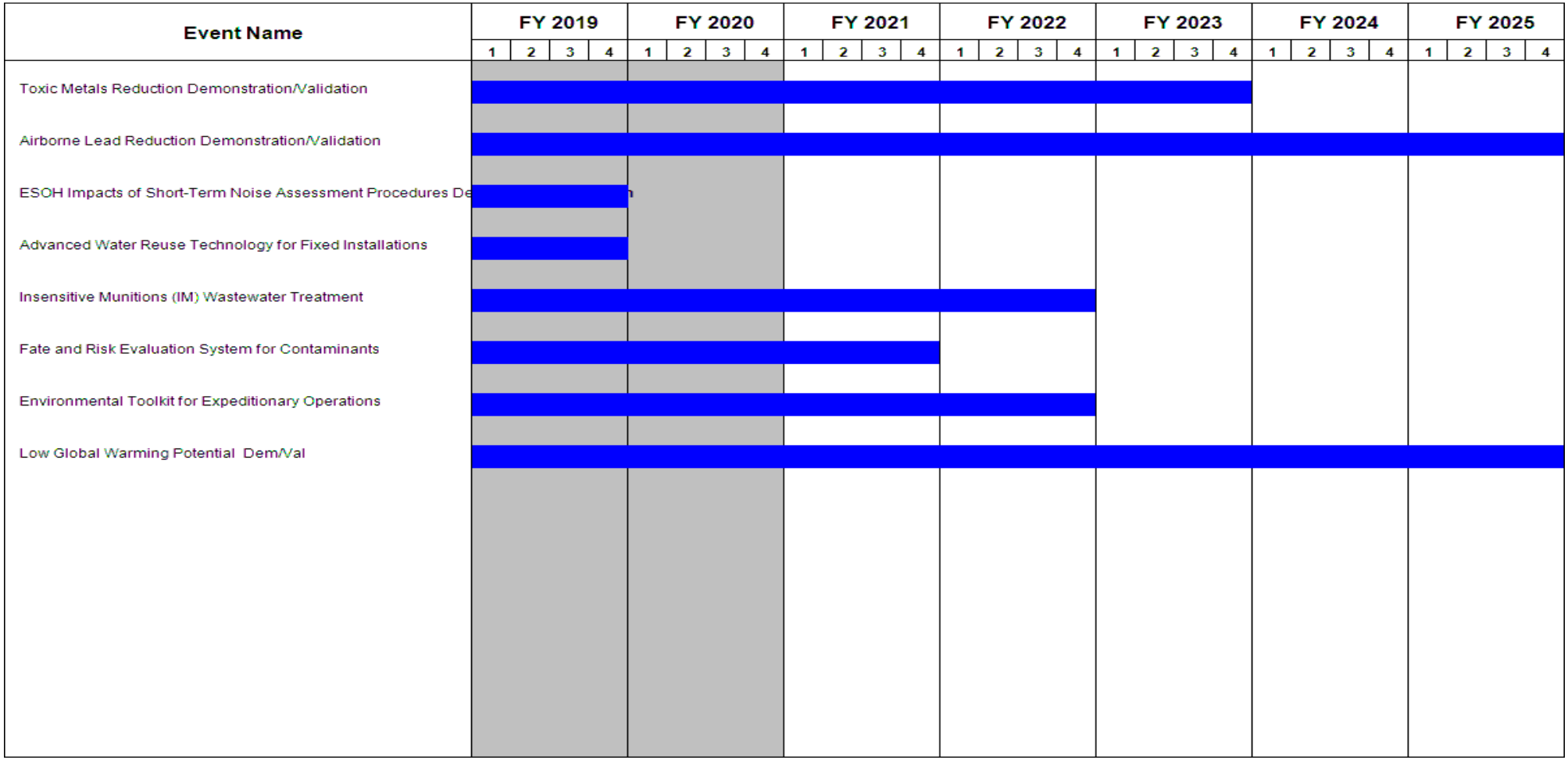

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603779A / *Environmental Quality Technology - Dem/Val*	**Project (Number/Name)** E21 / *Environmental Quality Technology Dem/Val*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Toxic Metals Reduction Demonstration/Validation	1	2015	4	2023
Airborne Lead Reduction Demonstration/Validation	1	2015	4	2025
ESOH Impacts of Short-Term Noise Assessment Procedures Demonstration/Validation	1	2016	4	2019
Advanced Water Reuse Technology for Fixed Installations	1	2016	4	2019
Insensitive Munitions (IM) Wastewater Treatment	1	2018	4	2022
Fate and Risk Evaluation System for Contaminants	1	2019	4	2021
Environmental Toolkit for Expeditionary Operations	1	2019	4	2022
Low Global Warming Potential Dem/Val	1	2019	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603790A *I NATO Research and Development*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	3.564	5.406	4.762	-	4.762	4.852	4.951	5.008	5.066	0.000	33.609
691: *NATO Rsch & Devel*	-	3.564	5.406	4.762	-	4.762	4.852	4.951	5.008	5.066	0.000	33.609

A. Mission Description and Budget Item Justification

This Project implements the provisions of Title 10 United States (U.S.) Code, Section 2350a, Cooperative Research and Development (R&D) Projects: Allied Countries. The objective is to improve, through the application of emerging technologies, the conventional defense capabilities of the U.S. and our cooperative partners, including the North Atlantic Treaty Organization (NATO), U.S. major non-NATO allies and Friendly Foreign countries through technology sharing and joint equipment development, thereby reducing U.S. acquisition costs. Cooperative efforts also improve multinational force compatibility with potential coalition partners through the development and use of similar equipment and improved interfaces. The Project focuses specifically on international cooperative technology demonstration, validation, and interoperability of Army weapon and command, control, communications and information (C3I) systems, including the NATO Defense Against Terrorism initiatives. Activities are implemented through international agreements with foreign partners that define scope, cost and work sharing arrangements, management, contracting, security, data protection and third party transfers. Funds are used to pay for only the U.S. work share that occurs in the United States at U.S. Government and U.S. contractor facilities.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	3.682	5.406	5.516	-	5.516
Current President's Budget	3.564	5.406	4.762	-	4.762
Total Adjustments	-0.118	0.000	-0.754	-	-0.754
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.118	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.754	-	-0.754

Change Summary Explanation

FY 2021 funding decrease to realize efficiencies per Leadership Priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / *NATO Research and Development*	Project (Number/Name) 691 / *NATO Rsch & Devel*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
691: *NATO Rsch & Devel*	-	3.564	5.406	4.762	-	4.762	4.852	4.951	5.008	5.066	0.000	33.609
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project implements the provisions of Title 10 United States (U.S.) Code, Section 2350a, Cooperative Research and Development (R&D) Projects: Allied Countries. The objective is to improve, through the application of emerging technologies, the conventional defense capabilities of the U.S. and our cooperative partners, including the North Atlantic Treaty Organization (NATO), U.S. major non-NATO allies and Friendly Foreign countries through technology sharing and joint equipment development, thereby reducing U.S. acquisition costs. Cooperative efforts also improve multinational force compatibility with potential coalition partners through the development and use of similar equipment and improved interfaces. The Project focuses specifically on international cooperative technology demonstration, validation, and interoperability of Army weapon and command, control, communications and information (C3I) systems, including the NATO Defense Against Terrorism initiatives. Activities are implemented through international agreements with foreign partners that define scope, cost and work sharing arrangements, management, contracting, security, data protection and third party transfers. Funds are used to pay for only the U.S. work share that occurs in the United States at U.S. Government and U.S. contractor facilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Armaments Cooperation Enterprise Support	2.687	4.098	3.609
Description: Armaments Cooperation Enterprise Support/ International Online (IOL) Development and Implementation NATO/ International Cooperative R&D (AR 70-41) and International Acquisition (AR 70-1, AR 70-3). The goal of this activity is to expand worldwide allied standardization and interoperability through cooperative Research and Development (R&D) and technology sharing per SECDEF guidance and especially in support of the U.S. Army. The execution AR 70-41 responsibilities requires DASA (DE&C) to conduct engagement with key strategy foreign partners in all regions of the world through the SNR(A) program, international agreement negotiations, and other bilateral and multilateral forums involving DASA (DE&C) personnel. This program will fund the travel costs and administrative support (studies, analysis, interpretation, equipment, etc.) required to participate internationally, such as the NATO Army Armaments Group (NAAG), Defense Against Terrorism (DAT) and to pursue new cooperative R&D initiatives and international cooperative agreements such as memoranda of understanding. ***FY 2020 Plans:*** Funds will allow the coordination for cooperative research, development and evaluation of defense technologies / systems / equipment plus joint production and follow-on support of defense systems or equipment and the procurement of foreign technologies. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funds will allow the coordination for cooperative research, development and evaluation of defense technologies / systems / equipment plus joint production and follow-on support of defense systems or equipment and the procurement of foreign technologies. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding decrease to realize efficiencies per Leadership Priorities.			
Title: Communications Interoperability, and Electronics Technologies ***Description:*** The goal of this activity is to develop technologies that enable interoperability among partner countries' command, control, communications, sensors, and information systems. Efforts include development of a single solution standard avoiding development of multiple unique solutions and leverage existing interoperability standards developed by NATO. Such standards include common doctrine, technical and procedural specifications to make better use of existing information, shared data, leveraged national operating picture capabilities and enable the development of interoperability of data, databases, applications, security domains and national networks architectures. Includes efforts from areas formerly titled Multi-National Network Enabled Capabilities, Low Level Air Defense Interoperability, JTRS, Combat Identification, and Multilateral Interoperability Program. ***FY 2020 Plans:*** FY 2020 funds include efforts from areas formerly titled Multi-National Network Enabled Capabilities, Low Level Air Defense Interoperability, JTRS, Combat Identification, and Multilateral Interoperability Program. ***FY 2021 Plans:*** FY 2021 funding include efforts from areas formerly titled Multi-National Network Enabled Capabilities, Low Level Air Defense Interoperability, JTRS, Combat Identification, and Multilateral Interoperability Program. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** A decrease in funding from FY 2020 to FY 2021 due to economic adjustments.	0.203	0.302	0.266
Title: Senior National Representatives (Army) (SNR-(A)) ***Description:*** Senior National Representatives (Army) (SNR-(A)) Projects (Partners: France, Germany, United Kingdom and Italy): Supports harmonization of programs at various levels: exchanging information, identifying knowledge gaps and conducting feasibility studies to further promote cooperative development; standardizing, fielding and road-mapping various processes; distributing the workload among the different nations. Technology Demonstrations hosted by the U.S. reps to Land Group 6, NATO Army Armaments Group (NAAG), will provide an opportunity to observe and demonstrate the current and future capability of participating NATO nations with a view to assisting future operational and materiel interoperability. Army support of NAAG studies, analysis and technology demonstrations.	0.021	0.031	0.028

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Funds will be used to pursue cooperative initiatives that were postponed, cancelled or not pursued due to funding reductions in previous years such as forums and engagement with long-standing foreign partners to identify interoperability gaps and develop necessary standardization programs. ***FY 2021 Plans:*** Funds will be used to pursue cooperative initiatives that were postponed, cancelled or not pursued due to funding reductions in previous years such as forums and engagement with long-standing foreign partners to identify interoperability gaps and develop necessary standardization programs. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** A decrease in funding from FY 2020 to FY 2021 due to economic adjustments.			
Title: Weapons and Munitions Technologies	0.163	0.243	0.214
Description: The goal of this activity is to cooperate with partner countries to increase interoperability and develop jointly technologies to improve range, payloads, speed, survivability and lethality to maintain U.S. technical superiority and combat overmatch for Army weapons systems and associated munitions. Areas of cooperation include fuzing and warhead systems, guidance systems, counter improvised explosive device neutralization, directed energy, and fire control systems. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries. ***FY 2020 Plans:*** Weapons and munitions technologies (Partners: France, Germany, Italy, UK): The Participants in this program will develop an automated software interface between their national field artillery command and control systems. The nations will be able to receive and provide mutual fire support (i.e. cannon and rocket fire) in combined operations more rapidly and with minimal errors. ***FY 2021 Plans:*** Weapons and munitions technologies (Partners: France, Germany, Italy, UK): The Participants in this program will develop an automated software interface between their national field artillery command and control systems. The nations will be able to receive and provide mutual fire support (i.e. cannon and rocket fire) in combined operations more rapidly and with minimal errors. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** A decrease in funding from FY 2020 to FY 2021 due to economic adjustments.			
Title: Ground Systems Technologies	0.163	0.243	0.214

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: The goal of this activity is to cooperate with partner countries to increase interoperability and develop jointly technologies to improve survivability, weapons, ground platforms (manned and unmanned), and mobility and counter-mobility to provide soldiers with unmatched offensive and defensive capabilities in weapons and military vehicles. Areas of cooperation include ground systems design, propulsion, structures, robotics, alternative fuels and lubricants, systems integration, electronics, and power management. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries. ***FY 2020 Plans:*** FY 2020 funding will be used to fund the continuation of cooperative projects in armored vehicle underbody blast protection and unmanned ground vehicles such as Hybrid Electric Project Agreement between US and Japan. ***FY 2021 Plans:*** FY 2021 funding will be used to fund the continuation of cooperative projects in armored vehicle underbody blast protection and unmanned ground vehicles such as Hybrid Electric Project Agreement between US and Japan. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** A decrease in funding from FY 2020 to FY 2021 due to economic adjustments.			
Title: Aviation Systems Technologies	0.327	0.489	0.431
Description: The goal of this activity is to cooperate with partner countries to increase interoperability and develop jointly improved aerodynamics, aeromechanics, avionics, weapons and sensor integration, propulsion, and aviation autonomy technologies that improve range, payloads, speed, survivability and lethality to maintain U.S. technical superiority and combat overmatch for vertical lift aviation systems. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries. ***FY 2020 Plans:*** FY 2020 funding will be used to pursue cooperative projects (i.e., the development of advance rotorcraft technologies and improve systems that aid pilots and aircrew in degraded visual environments). ***FY 2021 Plans:*** FY 2021 funding will be used to pursue cooperative projects (i.e., the development of advance rotorcraft technologies and improve systems that aid pilots and aircrew in degraded visual environments). ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
A decrease in funding from FY 2020 to FY 2021 due to economic adjustments.			
Accomplishments/Planned Programs Subtotals	3.564	5.406	4.762

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Acquisition Strategy:
The goal of this program is to expand worldwide allied standardization interoperability through cooperative research and development (R&D) and technology sharing per SECDEF guidance and especially in support of the of the U.S. Army.
All projects are test or technical demonstrations to feed into potential new requirements in support of Army Transformation to the Future Force or as product improvements to the Current Force.

List of the programs curently in place:
Communications, Interoperability, and Electronics Technologies
The goal of this project is to develop technologies that enable interoperability among partner countries' command, control, communications, sensors, and information systems. Efforts under this project include development of a single solution standard avoiding development of multiple unique solutions and leverage existing interoperability standards developed by NATO. Such standards include common doctrine, technical and procedural specifications to make better use of existing information, shared data, leverage national operating picture capabilities and enable the development of interoperability of data, databases, applications, security domains and national networks architectures. Includes projects formerly titled Multi-National Network Enabled Capabilities, Low Level Air Defense Interoperability, JTRS, Combat Identification, and Multilateral Interoperability Program.

Aviation Systems Technologies
The goal of this project is to cooperate with partner countries to increase interoperability and develop jointly improved aerodynamics, aeromechanics, avionics, weapons and sensor integration, propulsion, and aviation autonomy technologies that improve range, payloads, speed, survivability and lethality to maintain U.S. technical superiority and combat overmatch for vertical lift aviation systems. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries.

Ground Systems Technologies
The goal of this project is to cooperate with partner countries to increase interoperability and develop jointly technologies to improve survivability, weapons, ground platforms (manned and unmanned), and mobility and counter-mobility to provide soldiers with unmatched offensive and defensive capabilities in weapons and military vehicles. Areas of cooperation include ground systems design, propulsion, structures, robotics, alternative fuels and lubricants, systems integration, electronics, and

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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power management. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries.

Weapons and Munitions Technologies
The goal of this project is to cooperate with partner countries to increase interoperability and develop jointly technologies to improve range, payloads, speed, survivability and lethality to maintain U.S. technical superiority and combat overmatch for Army weapons systems and associated munitions. Areas of cooperation include fuzing and warhead systems, guidance systems, counter improvised explosive device neutralization, directed energy, and fire control systems. Such cooperative development will be done under the auspices of international agreements established among the participating countries for the purposes of improving defense capabilities of the U.S. and partner countries.

Armaments Cooperation Enterprise Support
The goal of this program is to expand worldwide allied standardization and interoperability through cooperative research and development (R&D) and technology sharing per SECDEF guidance and especially in support of the U.S. Army. This program will fund the travel costs and administrative support (studies, analysis, interpretation, equipment, etc.) required to participate internationally, such as the North Atlantic Treaty Organization (NATO) Army Armaments Group (NAAG), Defense Against Terrorism (DAT) and to pursue new cooperative R&D initiatives and international cooperative agreements such as memoranda of understanding. This program will also include: the United States' share of costs of the NATO Civil Budget, Chapter IX, which funds the NATO Industrial Advisory Group (NIAG) and the Special Fund for Cooperative Planning (U. S. Army is Executive Agent for this NATO bill); the Technical Cooperation Program, and Army armaments cooperation working groups with many nations.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ArmamentsCooperation Enterprise Support	MIPR	DASA DEC HQDA : Ft Belvoir, VA	0.010	-		-		-		-		-	0.000	0.010	-
Weapons and Munitions	TBD	CECOM : Aberdeen Proving Ground, MD	0.008	-		-		-		-		-	0.000	0.008	-
Communications Interoperability and Electronic Technologies Interoperability	MIPR	SPAWAR : Various	0.010	-		-		-		-		-	0.000	0.010	-
Ground Systems Technologies	MIPR	TARDEC : Warren, MI	0.010	-		-		-		-		-	0.000	0.010	-
Chemical and Biological Technologies	MIPR	Aberseen Proving Groun : MD	0.010	-		-		-		-		-	0.000	0.010	-
		Subtotal	0.048	-		-		-		-		-	0.000	0.048	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Missiles and Rocket Technologies	MIPR	APG, Redstone Arsenal : MD, AL	0.100	-		-		-		-		-	0.000	0.100	-
Communications, Interoperability, and Electronics Technologies	MIPR	CECOM, JTRS, COALWNW, JTNC, SPAWAR : San Diego,CA, various	0.529	-		-		-		-		-	0.000	0.529	-
Weapons and Munitions	Various	ARDEC, PEO AMMO, PM-CAS : VARIOUS	0.752	-		-		-		-		-	0.000	0.752	-
Aviation Systems Technologies	Various	AMRDEC : RED STONE, VARIOUS	0.175	-		-		-		-		-	0.000	0.175	-
Ground Systems Technology	FFRDC	Various : Various	0.125	-		-		-		-		-	0.000	0.125	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / *NATO Research and Development*	Project (Number/Name) 691 / *NATO Rsch & Devel*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNR(A)	C/TBD	ARDEC: Arlington, VA : Various	9.012	-		-		-		-		-	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	0.118		-		-		-		-	0.000	0.118	-
		Subtotal	10.693	0.118		-		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Armaments Cooperation Enterprise Support	C/FFP	LSS/GDIT : Fairfax, VA	6.639	1.746		2.870		2.530		-		2.530	0.000	13.785	-
Missiles and Rocket Technologies	MIPR	APG, Redstone Arsenal : MD, AL	0.100	0.600		0.895		0.785		-		0.785	0.000	2.380	-
Communications, Interoperability, and Electronics Technologies	MIPR	Joint Tactical Radio (JTRS), JTNC, COALWNW, SPAWAR, CERDEC, ARDEC W1DF : San Diego, CA, Red Stone Arsenal	0.959	0.300		0.448		0.395		-		0.395	0.000	2.102	-
Aviation Systems Technologies	MIPR	RDECOM/ AMRDEC : Red Stone Arsenal	0.810	0.300		0.448		0.395		-		0.395	0.000	1.953	-
Ground Systems Technology	MIPR	TARDEC : Various	0.478	-		-		-		-		-	0.000	0.478	-
Weapons and Munitions	Various	CECOM, ARDEC, AMMO, PEO C3T : Aberdeen Proving Ground, Various	1.039	0.500		0.745		0.657		-		0.657	0.000	2.941	-
Soldier Technologies	TBD	Various : Various	0.346	-		-		-		-		-	0.000	0.346	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / *NATO Research and Development*	Project (Number/Name) 691 / *NATO Rsch & Devel*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SNR(A)	C/TBD	ARL, HQDA, JCGISR: Army : Various	2.318	-		-		-		-		-	Continuing	Continuing	Continuing
Chemical & Biological Defense Technologies	MIPR	ECBC : Edgewood, Aberdeen, MD	0.270	-		-		-		-		-	0.000	0.270	-
		Subtotal	12.959	3.446		5.406		4.762		-		4.762	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Communications, Interoperability, and Electronics Technologies	Various	JTRN, JTNC, COALWNW, CERDEC, NIGHT VISION : SPAWAR	0.444	-		-		-		-		-	0.000	0.444	-
Weapons and Munitions	TBD	ARDEC, PEO AMMO, ASCA : Various	0.200	-		-		-		-		-	0.000	0.200	-
Aviation Systems Technologies	TBD	RDECOM, AMRDEC : RED STONE	0.080	-		-		-		-		-	0.000	0.080	-
Ground Systems Technologies	MIPR	TARDEC : Various	0.050	-		-		-		-		-	0.000	0.050	-
		Subtotal	0.774	-		-		-		-		-	0.000	0.774	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	24.474	3.564		5.406		4.762		-		4.762	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

	FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017				FY 2018			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
N/A																					[redacted]							

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
N/A																												

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603790A / *NATO Research and Development*	**Project (Number/Name)** 691 / *NATO Rsch & Devel*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
N/A	1	2017	4	2017

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603801A *I Aviation - Adv Dev*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	93.885	505.890	647.937	-	647.937	789.356	913.940	921.548	1,525.379	Continuing	Continuing
B47: *Future Vertical Lift*	-	93.885	107.590	134.436	-	134.436	178.235	483.442	773.385	871.644	Continuing	Continuing
F12: *Future Attack Reconnaissance Aircraft*	-	0.000	398.300	513.501	-	513.501	611.121	430.498	148.163	653.735	Continuing	Continuing

A. Mission Description and Budget Item Justification

Future Vertical Lift (FVL) is an initiative to develop a family of vertical lift aircraft for the United States Armed Forces. The Department of Defense (DOD) established FVL to focus vertical lift capabilities and technology development as well as retain long-term industrial base capabilities. The Deputy Secretary of Defense issued the FVL Strategic Plan in 2012 to outline a joint approach for the next generation vertical lift aircraft for all military services. The Strategic Plan provided a foundation for replacing the current fleet with advanced capability by shaping the development of vertical lift aircraft for the next 25 to 40 years. In Fiscal Year (FY) 2017, the Army identified FVL as one of the Army's six modernization priorities, and established the FVL Cross Functional Team. The FVL objectives are increased vertical lift maneuverability, range, speed, payload, survivability, and reliability while reducing the logistical footprint. This capability will provide critical aviation support to the joint warfighter and maneuver force. FVL will integrate advanced technologies and design configurations with appropriate trades to ensure affordability.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	86.180	459.290	536.067	-	536.067
Current President's Budget	93.885	505.890	647.937	-	647.937
Total Adjustments	7.705	46.600	111.870	-	111.870
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-34.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	80.600			
• Congressional Directed Transfers	-	-			
• Reprogrammings	7.705	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	111.870	-	111.870

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: B47: *Future Vertical Lift*		
Congressional Add: *Competitive Demonstration Risk Reduction*	-	75.600
Congressional Add: *Future Attack Reconnaissance Aircraft*	75.400	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603801A *I Aviation - Adv Dev*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Congressional Add Subtotals for Project: B47	75.400	75.600
Project: F12: *Future Attack Reconnaissance Aircraft*		
Congressional Add: *Future Long Range Assault Aircraft University Partnership Effort*	-	5.000
Congressional Add Subtotals for Project: F12	-	5.000
Congressional Add Totals for all Projects	75.400	80.600

Change Summary Explanation

FY 2019, Future Long Range Assault Aircraft (FLRAA) Capability Set Three increased by $7.628 million (Below Threshold Reprogramming) for additional staffing in acquisition, engineering, logistics, and business functionals to support development of Program of Record strategy, acquisition documentation, Contracts Requirements Package (CRP), and Competitive Demonstration Risk Reduction efforts. The Army's Future Attack Reconnaissance Aircraft (FARA) Capability Set One competitive prototyping effort was initiated in FY 2019 with a Congressional Add on Project B47 Future Vertical Lift. In FY 2020, FARA funds are requested under Project F12 Future Attack Reconnaissance Aircraft.

FLRAA FY 2020 budget increased by $75.6 million for Competitive Demonstration Risk Reduction efforts and $5 million for university partnership efforts. FARA FY 2020 budget decreased by $34.0 million to align with current Competitive Prototyping efforts. FLRAA budget increase of $5 million for university partnership efforts is aligned incorrectly to Project F12 Future Attack Reconnaissance Aircraft. This funding will be correctly re-aligned to Project B47 Future Vertical Lift for execution.

FLRAA FY 2021 budget increased by $112.369 million for continued execution of Competitive Demonstration Risk Reduction efforts, development of the Contract Requirements Package, and initiation of the Source Selection Evaluation Board and the FARA FY 2021 budget decreased by $0.499 million.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / *Aviation - Adv Dev*	Project (Number/Name) B47 / *Future Vertical Lift*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
B47: *Future Vertical Lift*	-	93.885	107.590	134.436	-	134.436	178.235	483.442	773.385	871.644	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Future Vertical Lift (FVL) Project's funding provides for the development of a Future Long Range Assault Aircraft (FLRAA) Capability Set Three weapon system within the FVL family of systems. FLRAA will conduct air assault, urban assault/security, maritime interdiction, medical evacuation, humanitarian assistance/disaster relief, tactical resupply, direct action, non combatant evacuation operation, and combat search and rescue operations in support of the Army, including Special Operations Command (USSOCOM) and the Joint Force, in a contested, near peer threat environment. The FLRAA weapon system will retain the Army's ability to project combat power with significantly increased range, speed, mobility, and payload over current Army and USSOCOM aircraft. FLRAA achieved a Materiel Development Decision approval in October 2016 and the Office of Secretary of Defense granted a sufficiency determination of the Analysis of Alternatives (AoA) in July 2019. Fiscal Year (FY) 2019 funded completion of the AoA, continued to support initiation of program documentation, and funded establishment of an FVL Architecture Risk Reduction effort in support of Modular Open Systems Approach (MOSA) for both FLRAA and the Future Attack Reconnaissance Aircraft. FY 2020 funding will support continuation of the FVL Architecture Risk Reduction effort; support life cycle affordability efforts; initiate planning and proposal evaluations of the Competitive Demonstration Risk Reduction efforts; and support the completion of key program documents to include the Program Strategy, Weapon System Specification, Systems Engineering Plan, Life Cycle Sustainment Plan (LCSP) and Contract Requirements Package (CRP). FY 2021 funding supports the continued execution of the Competitive Demonstration Risk Reduction and MOSA efforts, development of the CRP, and the initiation of Source Selection Evaluation Board (SSEB).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: FVL Analysis of Alternatives (AoA) ***Description:*** FLRAA AoA modeling, simulation, and analysis performed by United States Army Training and Doctrine Command (U.S. TRADOC) Analysis Center, U.S. Army Materiel Systems Analysis Activity and other supporting agencies.	1.190	-	-
Title: Engineering Services / Research Studies ***Description:*** Engineering research, planning, modeling, and analysis. Documentation and reviews supporting the FLRAA acquisition program. ***FY 2020 Plans:*** Supported completed and staffed key Program documentation to include the Weapon System Specification and Systems Engineering Plan and continued developing the Test and Evaluation Master Plan and CRP. ***FY 2021 Plans:***	5.173	22.085	121.926

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** B47 / *Future Vertical Lift*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Continue execution of Competitive Demonstration Risk Reduction and MOSA efforts, support SSEB, and support key events leading to contract award. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase technical staff to support efforts leading to contract award.			
Title: Program Management ***Description:*** Oversight and Management of the FLRAA acquisition program. ***FY 2020 Plans:*** Started the initiate execution of Competitive Demonstration Risk Reduction activities, completed and staffed key Program documentation to include the Program Strategy, and continued developing the CRP ***FY 2021 Plans:*** Continue to complete efforts to refine affordability, execute of Competitive Demonstration Risk Reduction, release Request for Proposal, and execute SSEB. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase Acquisition staff to support efforts leading to contract award.	9.654	5.063	7.326
Title: Supportability Analysis and Acquisition Support ***Description:*** Acquisition and supportability research, planning, modeling, analysis, documentation and reviews supporting the FLRAA acquisition program. ***FY 2020 Plans:*** Supported efforts to refine affordability refinement, completed the staffing of the Life Cycle Sustainment Plan (LCSP) and continued developing the CRP. ***FY 2021 Plans:*** Continue to support the developing of the CRP and the initiation of the SSEB. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase Logistics staff to support efforts leading to contract award.	2.468	3.526	5.184
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	1.316	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** B47 / *Future Vertical Lift*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	18.485	31.990	134.436

	FY 2019	FY 2020
Congressional Add: Competitive Demonstration Risk Reduction	-	75.600
FY 2020 Plans: Competitive Demonstration Risk Reduction		
Congressional Add: Future Attack Reconnaissance Aircraft	75.400	-
FY 2019 Accomplishments: Future Attack Reconnaissance Aircraft		
Congressional Adds Subtotals	75.400	75.600

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 313: *Adv Rotarywing Veh Tech*	109.610	-	0.000	-	0.000	-	-	-	-	0.000	109.610

Remarks

Program Element (PE) 0603003A Aviation Advanced Technology Project 313 Advanced Rotary-wing Vehicle Technology funds Army Science & Technology (S&T) projects to mature, demonstrate and integrate components, subsystems and systems for vertical lift and unmanned air vehicle technologies. These projects enables Army aviation modernization and reduce risk for FLRAA.

D. Acquisition Strategy

The Army is executing an accelerated acquisition approach to design, develop, and deliver the FLRAA weapons system. In order to support the Army's modernization strategy and concept for multi-domain operations, the FLRAA program will deliver a first unit equipped in FY 2030. This accelerated approach builds on the Joint Multi-Role Technology Demonstration (JMR-TD) efforts (ongoing since 2013); the Army's AoA (completed in July 2019); and multiple ongoing risk mitigation efforts.

The Army's risk mitigation activities ahead of the Program of Record (PoR) include: (1) additional conceptual design and flight envelop expansion tasks on the four existing JMR-TD Technology Investment Agreements; (2) a modular open systems approach (MOSA), FVL Architecture Collaboration Working Group (with participation from industry and academia) to establish a common architecture requirements framework for FLRAA and FARA system development; and (3) a Competitive Demonstration and Risk Reduction (CD&RR) effort using an Aviation Missile and Technology Consortium (AMTC) Other Transaction Authority (OTA) agreements to provide substantiating technical documentation on weapon system designs, requirements decompositions, trade-studies, and requirements feasibility for the FLRAA PoR.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** B47 / *Future Vertical Lift*

These risk reduction activities maintain industry engagement & momentum from the JMR-TD S&T program, inform capabilities and system requirements, and provide initial trade assessments for the final operational requirements. They also inform the final acquisition strategy; mature the Government's architecture requirements development; and transition appropriate S&T data and technologies to the PoR. The Army plans to initiate the PoR in FY 2022 with a hybrid acquisition approach. This approach includes the opportunity to employ new DODI 5000.80 authorities along with a tailored DODI 5000.02 acquisition strategy.

Finally, the Army is also addressing life cycle affordability, sustainability, and maintainability early in the program. The FLRAA program is employing multiple strategies including: should cost reduction opportunities; use of a digital thread from design through sustainment; and stochastic sustainment modeling. Additionally, FLRAA is one of the Army's pilot programs for life cycle intellectual property and data strategy development.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / *Aviation - Adv Dev*	Project (Number/Name) B47 / *Future Vertical Lift*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	various : Redstone Arsenal, AL	-	3.060	Dec 2018	5.063	Dec 2019	7.326	Dec 2020	-		7.326	Continuing	Continuing	Continuing
Program Management	MIPR	Army Contracting Command : Redstone Arsenal, AL	-	0.044	May 2019	-		-		-		-	Continuing	Continuing	-
Program Management	MIPR	Aviation and Missile Command : Redstone Arsenal, AL	-	0.734	Oct 2018	-		-		-		-	Continuing	Continuing	-
Program Management	MIPR	Aviation Missile Center Combat Capabilities Combat Command : Redstone Arsenal, AL	-	2.399	Nov 2018	-		-		-		-	Continuing	Continuing	-
Program Management	Option/ FFP	Torch Technologies, Avion Solutions, various : Redstone Arsenal, AL	-	4.500	Dec 2018	-		-		-		-	Continuing	Continuing	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.316		-		-		-	0.000	1.316	-
		Subtotal	-	10.737		6.379		7.326		-		7.326	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Analysis of Alternatives (AoA)	TBD	TRADOC Analysis Center : Fort Leavenworth, KS	-	1.190	Nov 2018	-		-		-		-	0.000	1.190	-
		Subtotal	-	1.190		-		-		-		-	0.000	1.190	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / *Aviation - Adv Dev*	Project (Number/Name) B47 / *Future Vertical Lift*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Services / Research Studies - Organic	MIPR	VARIOUS : VARIOUS	-	0.039	Nov 2018	13.114	Feb 2020	2.268	Mar 2021	-		2.268	Continuing	Continuing	Continuing
Engineering Services/ Competitive Demonstration Risk Reduction - Other	C/TBD	TBD : TBD	-	-		75.600	Mar 2020	-		-		-	0.000	75.600	-
Engineering Services / Research Studies - Other	C/CPFF	Georgia Tech Research Institute : Huntsville, AL	-	2.917	Aug 2019	8.971	Mar 2020	-		-		-	Continuing	Continuing	Continuing
Engineering Services / Research Studies - Other	Option/ FFP	varioius : Huntsville, AL	-	0.512	May 2019	-		119.658	Mar 2021	-		119.658	0.000	120.170	Continuing
Engineering Services / Research Studies - Other	Option/ FFP	John H Northrup & Associates : Huntsville, AL	-	0.227	Jun 2019	-		-		-		-	0.000	0.227	-
Acquisition and Supportability Analysis	C/Various	Army Materiel Command / Army Contracting Command/Army Future Command : Redstone Arsenal, AL	-	2.468	Dec 2018	3.526	Nov 2019	5.184	Nov 2020	-		5.184	Continuing	Continuing	Continuing
Future Attack Reconnaissance Aircraft Execution	C/Various	CCDC AvMC : Redstone Arsenal, AL	-	75.400	Jun 2019	-		-		-		-	0.000	75.400	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	0.395	Nov 2019	-		-		-		-	0.000	0.395	-
		Subtotal	-	81.958		101.211		127.110		-		127.110	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	93.885		107.590		134.436		-		134.436	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** B47 / *Future Vertical Lift*

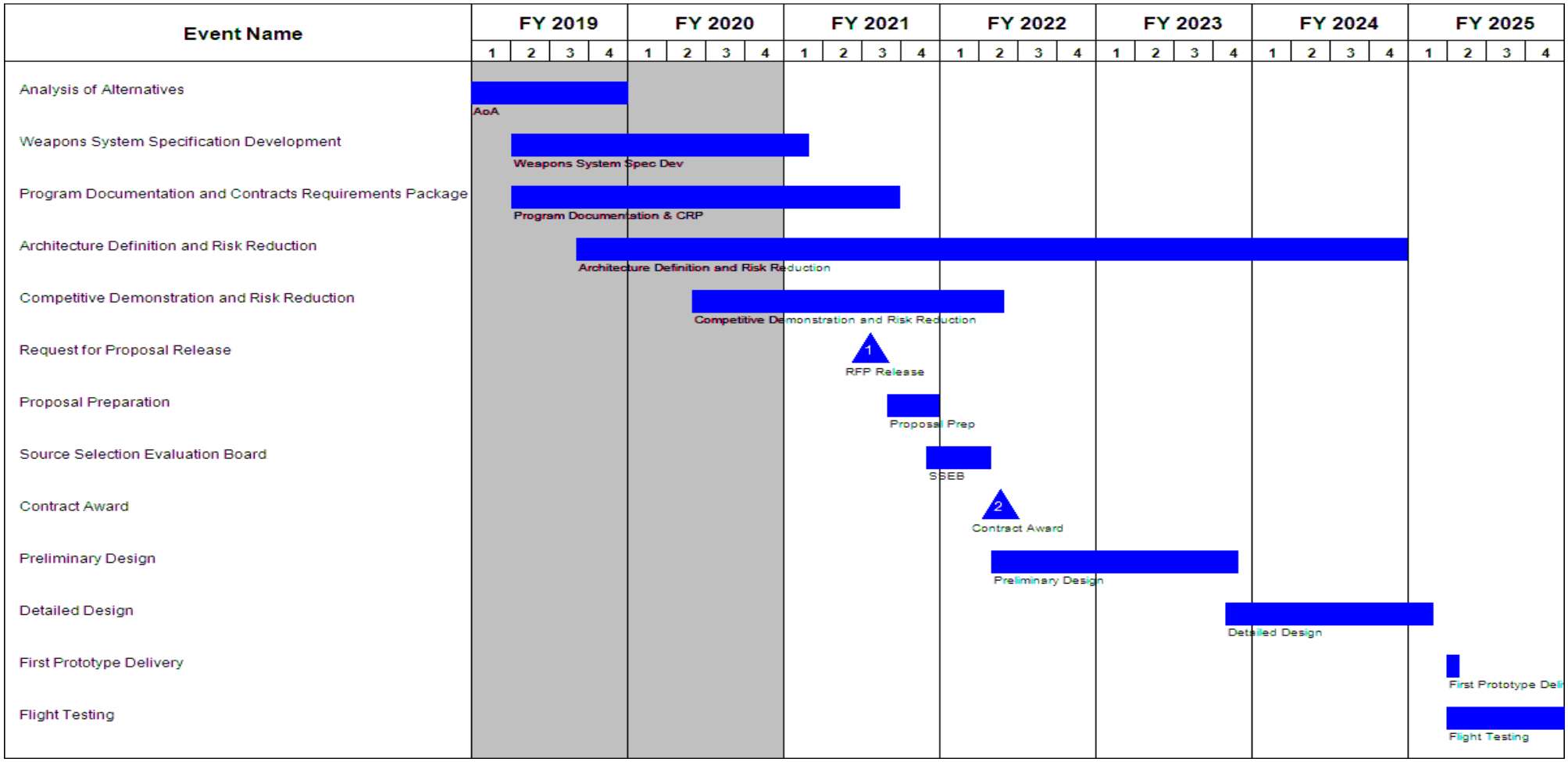

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** B47 / *Future Vertical Lift*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Materiel Development Decision	1	2017	1	2017
Analysis of Alternatives	3	2017	4	2019
Weapons System Specification Development	2	2019	1	2021
Program Documentation and Contracts Requirements Package	2	2019	3	2021
Architecture Definition and Risk Reduction	3	2019	4	2024
Competitive Demonstration and Risk Reduction	2	2020	2	2022
Request for Proposal Release	3	2021	3	2021
Proposal Preparation	3	2021	4	2021
Source Selection Evaluation Board	4	2021	2	2022
Contract Award	2	2022	2	2022
Preliminary Design	2	2022	4	2023
Detailed Design	4	2023	1	2025
First Prototype Delivery	2	2025	2	2025
Flight Testing	2	2025	4	2029

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / *Aviation - Adv Dev*	Project (Number/Name) F12 / *Future Attack Reconnaissance Aircraft*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
F12: *Future Attack Reconnaissance Aircraft*	-	0.000	398.300	513.501	-	513.501	611.121	430.498	148.163	653.735	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Future Attack Reconnaissance Aircraft (FARA) Project's funding provides for the development of a Capability Set 1 aircraft system within the Future Vertical Lift (FVL) family of systems. FVL Capability Set 1 aircraft will conduct attack/reconnaissance missions in support of the Army's modernization objective of conducting Multi-Domain Operations (MDO). The FARA platform will fill the gap in capability for light weight attack/reconnaissance while significantly increasing speed, range, survivability, and lethality, providing Combatant Commanders with greatly increased tactical, operational and strategic capabilities.

The FVL Capability Set 1 Initial Capabilities Requirements Document was approved in July 2018 under the name Future Attack Reconnaissance Aircraft (FARA). The Acquisition Approach and Determination & Findings for Other Transaction Authority for Prototyping agreements were approved on 1 February 2019 by the Acting Under Secretary of Defense (Acquisition and Sustainment) to execute a Competitive Prototyping effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Future Attack Reconnaissance Aircraft	-	375.487	513.501
Description: Design, build, and test competitive prototypes in preparation to rapidly develop and field a Multi-Domain Operations capable attack/reconnaissance vertical lift aircraft. ***FY 2020 Plans:*** At the completion of the initial design phase, two industry solutions was chosen to continue to final design, build, and test. ***FY 2021 Plans:*** Continue to complete final prototype design, begin hardware fabrication and software development, begin component/sub-system qualification testing, and begin assembly and Mission Equipment assessment and integration. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Fiscal Year (FY) 2021 Research Development Test & Evaluation (RDT&E) funding increased to meet increased requirements for the material purchase, tooling development, and engineering support required to build and integrate two FARA prototypes.			
Title: FY 2020 SBIR/STTR Transfer	-	17.813	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** F12 / *Future Attack Reconnaissance Aircraft*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	393.300	513.501

	FY 2019	FY 2020
Congressional Add: Future Long Range Assault Aircraft University Partnership Effort	-	5.000
FY 2020 Plans: Future Long Range Assault Aircraft University Partnership Effort		
Congressional Adds Subtotals	-	5.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• B47: *Future Vertical Lift*	93.885	107.590	134.436	-	134.436	178.235	483.442	773.385	871.644	Continuing	Continuing

Remarks

The FARA Competitive Prototype effort was initiated in FY 2019 with Congressional Add of $75.400 million under Program Element (PE) 0603801A Aviation - Adv Dev Project B47 Future Vertical Lift, which was shared with Future Long Range Assault Aircraft. FARA requirements will be executed under PE 0603801A Aviation - Adv Dev Project F12 Future Attack Reconnaissance Aircraft from FY 2020 and beyond.

D. Acquisition Strategy

The Future Attack Reconnaissance Aircraft (FARA) program is executing a streamlined acquisition approach leveraging modern tools, processes, industry innovation, and leveraging efficiencies through the recently implemented Army Cross Functional Teams (CFT) strategy. The aircraft developed under this program will utilize a modular open system approach, which will enable more efficient and cost effective mission equipment integration throughout the lifecycle of the weapon system.

The Army is executing a FARA Competitive Prototyping (CP) effort from FY 2019-2023 using Other Transaction Authority for Prototyping (OTAP) awards to five industry performers and will be executed utilizing a two-phased approach. The scope of this effort includes prototype design and fabrication process refinement, subsystem and representative system level testing, flight control and mission processor software development and testing, development of systems integration labs, development or modification of test fixtures and facilities, preparation of test plans and reports, the generation of airworthiness documentation, and qualification testing of all processes and subsystems within the prototype aircraft.

Phase one is the initial design phase which was awarded in April 2019 and phase two will begin in March 2020 when two of the five vendors are selected for final detailed design and the development, integration and test of a flyable prototype air vehicle. Phase two will culminate with a government flight test evaluation of the FARA Competitive Prototype no later than the end of FY 2023.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** F12 / *Future Attack Reconnaissance Aircraft*

The Competitive Prototype effort will inform full FARA Weapon System requirements development process, and will develop the data needed to reduce the risks for full weapon system design, integration, testing, and qualification to be completed during the FARA engineering, manufacturing and development phase.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / *Aviation - Adv Dev*	Project (Number/Name) F12 / *Future Attack Reconnaissance Aircraft*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		17.813		-		-		-	0.000	17.813	-
		Subtotal	-	-		17.813		-		-		-	0.000	17.813	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Competitive Prototype Execution	C/Various	CCDC AvMC : Redstone Arsenal, AL	-	-		375.487	Mar 2020	513.501	Apr 2019	-		513.501	Continuing	Continuing	Continuing
		Subtotal	-	-		375.487		513.501		-		513.501	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Services/ Research Studies - Other	Option/ CPFF	TBD : Huntsville, AL	-	-		5.000	Mar 2020	-		-		-	0.000	5.000	-
		Subtotal	-	-		5.000		-		-		-	0.000	5.000	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		398.300		513.501		-		513.501	Continuing	Continuing	N/A

Remarks

Under the Other Transaction Authorities for Prototyping (OTAP), five incrementally funded agreements were awarded in April 2019 which have payments based on performance milestones through Fiscal Year (FY) 2023. There will be no additional contract awards or contract options executed. Funding will be incrementally added to the existing awards by modification as negotiated with each performer. In March 2020, two of the five performers will be selected for continued execution and the other three performers will be issued a stop work order and cease to receive additional funding.

NOTE: $5.000 million Congressional add for Future Long Range Assault Aircraft for university partnerships to be re-aligned and executed on Project B47 / Future Vertical Lift.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** F12 / *Future Attack Reconnaissance Aircraft*

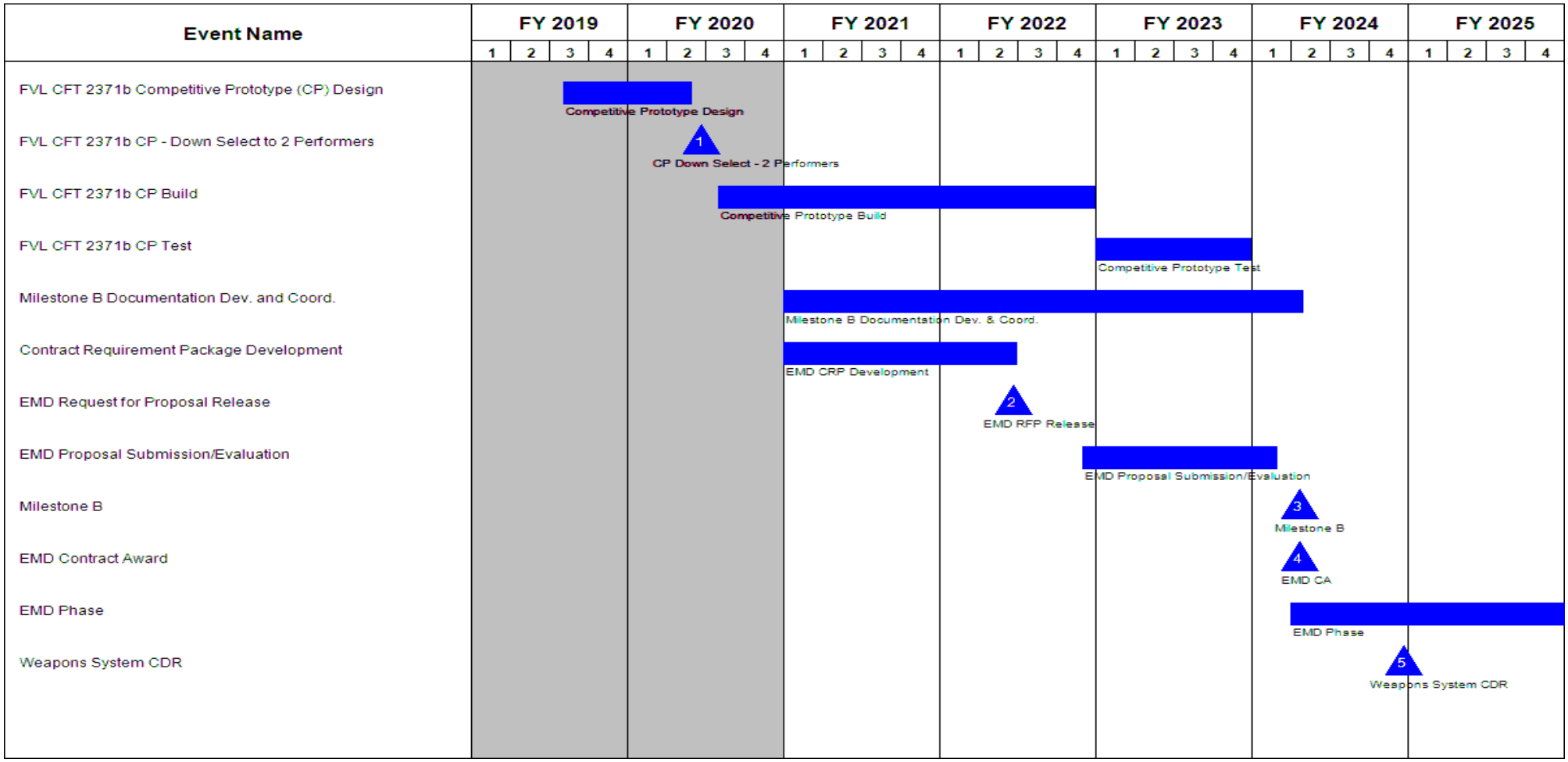

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603801A / *Aviation - Adv Dev*	**Project (Number/Name)** F12 / *Future Attack Reconnaissance Aircraft*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
FVL CFT 2371b Competitive Prototype (CP) Design	3	2019	2	2020
FVL CFT 2371b CP - Down Select to 2 Performers	2	2020	2	2020
FVL CFT 2371b CP Build	3	2020	4	2022
FVL CFT 2371b CP Test	1	2023	4	2023
Milestone B Documentation Dev. and Coord.	1	2021	2	2024
Contract Requirement Package Development	1	2021	2	2022
EMD Request for Proposal Release	2	2022	2	2022
EMD Proposal Submission/Evaluation	4	2022	1	2024
Milestone B	2	2024	2	2024
EMD Contract Award	2	2024	2	2024
EMD Phase	2	2024	4	2028
Weapons System CDR	4	2024	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603804A *I Logistics and Engineer Equipment - Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	18.845	7.339	4.761	-	4.761	7.723	2.416	2.417	2.411	Continuing	Continuing
526: *Marine Orien Log Eq Ad*	-	3.766	4.001	0.840	-	0.840	2.728	2.416	2.417	2.411	Continuing	Continuing
EW8: *Armored Engineer Vehicles*	-	3.506	0.000	3.921	-	3.921	4.995	0.000	0.000	0.000	0.000	12.422
G11: *Adv Elec Energy Con Ad*	-	6.224	3.338	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.562
K39: *Field Sustainment Support Ad*	-	2.234	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.234
VR8: *Combat Service Support Systems - Ad*	-	3.115	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.115

Note

Project EW8 - Armored Engineer Vehicles: FY 2021 funding in the amount of $3.921 million supports a new start effort to develop a robotic capability.

A. Mission Description and Budget Item Justification

This Program Element (PE) supports advanced component development and prototypes of new and improved technologies for combat support and combat service support equipment essential to sustaining combat operations. Advancements in bridging, armored engineer vehicles, electric power generators, material-handling, environmental control, shelter systems, cargo aerial delivery, field service systems, mortuary affairs equipment and petroleum equipment are necessary to improve safety and increase the tactical mobility, operational capability, lethality and survivability on the digital battlefield and to provide for greater sustainment while reducing the logistics support burden. Army Watercraft funding supports initiatives to enhance the seaworthiness, safety, survivability, supportability, energy efficiency, environmental, bulk fuel, water generation, regulatory compliance and reliability of existing systems.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603804A *I Logistics and Engineer Equipment - Adv Dev*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	17.230	7.339	6.124	-	6.124
Current President's Budget	18.845	7.339	4.761	-	4.761
Total Adjustments	1.615	0.000	-1.363	-	-1.363
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.615	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-1.363	-	-1.363

Change Summary Explanation

FY 2021 funding request realized a net reduction of $1.363 Million due to the following:
Project EW8 was increased $3.921 Million for a new start to develop robotic capability for Armored Engineer Vehicles.
Project 526 was decreased $2.083 Million due to low disbursement rate in FY 2019.
Project G11 was decreased by $3.201 Million to support the Army's modernization priorities in support of the National Defense Strategy.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) 526 / *Marine Orien Log Eq Ad*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
526: *Marine Orien Log Eq Ad*	-	3.766	4.001	0.840	-	0.840	2.728	2.416	2.417	2.411	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2021 Program funding reduced $1,363K was due to underexecution in FY 2019. This was a result of contract award delays, contractor delay, billings, etc.

A. Mission Description and Budget Item Justification

Project 526 Marine Orientation Logistics and Engineering Advanced Development supports Dynamic Force Repositioning (DFR) and provides the Combatant and Multi-Domain Task Force Commander with organic waterborne lift capability that can deliver today's Army maneuver platforms and equipment, and supply bulk fuel and water across the full spectrum of operations with increased speed and lower draft; and mitigates anti-access/area denial (A2/AD) threat by providing access to shallow coastal waters, rivers, in narrow inland waterways in support of dispersed force elements in austere environments and where mature ports or road networks are unavailable. The MSVs are critical modernization efforts in support of the Army's Watercraft Transformation Strategy (AWTS) and Army Force Package 2.0.

In general, this project supports efforts and studies for advanced component development, including prototypes of equipment and sub-systems to enhance the seaworthiness, safety, and survivability while increasing the lethality, tactical mobility, and operational capability of the Army Mariner to preserve the Combatant Commanders requirement of "freedom of seas" access in all areas of the world particularly the littorals, to support maneuver operations in all Areas of Responsibility.

In addition, funded efforts will address critical gaps in these areas for the legacy fleet, while at the same time researching, developing and testing emergent technologies. To support future acquisitions and future fleet planning, funding efforts will include conducting trade studies, Business Case Analyses to inform the requirement development process, and support Analysis of Alternatives (AoA). The funding enables Army's compliance with the National Defense Authorization Act of 1996 and 502(6) of the Clean Water Act and compliance with Environmental protection Agency (EPA) emission standards.

FY 2021 RDTE dollars in the amount of $0.841 million supports modernization of the legacy fleet by investigating technology insertions, including, but not limited to: force protection, condition based maintenance, vessel electronics, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

In FY 2021, $0.178 million in Reimbursable Manpower for this line has been realigned from Reimbursable Civilian Funding to Direct Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: At Sea Transfer Technology	3.124	1.004	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** 526 / *Marine Orien Log Eq Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: At Sea Transfer Technology enables roll on and roll off (RO/RO) capability from vessels at sea and causeway transport of vehicles and equipment to the beach or shore. The current effort serves to inform development of a Service Life Extension Program (SLEP) for the Modular Warping Tug (MWT) and Causeway Ferry (CF) which are principle working platforms in the Modular Causeway System (MCS). ***FY 2020 Plans:*** Perform testing of MWT/CF SLEP prototype and to complete Technical Data Package for a reference for the Maritime workforce. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease is due to MWT/CF SLEP finalizing testing and transitioning to Procurement funding.					
Title: Environmental Compliance Projects ***Description:*** Environmental projects enable compliance with requirements as defined under in the law Uniform National Discharge Standards (UNDS) and Environmental Protection Agency (EPA) emissions standards. The EPA reviews the UNDS Code of Federal Regulations (CFR) language in five-year increments separated into three batches (types of discharge). This is an ongoing assessment of statutory language which may or may not result in material solution change. ***FY 2020 Plans:*** Identification of Environmental Compliance Technologies IAW evolving statutory and regulatory requirements and ensure ships are compliant. Will also fund Navy efforts for UNDS analysis and committee representation. ***FY 2021 Base Plans:*** Identification of Environmental Compliance Technologies IAW evolving statutory and regulatory requirements and ensure ships are compliant. This accomplishment will also fund Navy efforts for UNDS analysis and committee representation. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding increase to support establishing Performance standards for Batch Three discharges and develop Implementation of DOD instruction for the Mariners.	-	0.038	0.095	-	0.095
Title: Force Protection Capability ***Description:*** Army Watercraft Systems (AWS) Force Protection capability is limited to defensive measures. Current efforts include development of gunner station and weapon station locations, integration of Common	-	0.478	0.445	-	0.445

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** 526 / *Marine Orien Log Eq Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Remotely Weapon Station (CROWS) and non-lethal Escalation of Force (EoF). The EoF capability includes white light, green dazzler, an acoustic hailing device, percussion grenades, and Forward Looking Infra-Red (FLIR) cameras. ***FY 2020 Plans:*** Will design, Install, and test CROWS aboard LCU and LSV 7 class vessels. ***FY 2021 Base Plans:*** Provide support to design, install, and test CROWS aboard LCU watercraft fleet.The EoF capabilities could include, but are not limited to, white light, green dazzler, an acoustic hailing device, percussion grenades, and Electro-Optical / Infrared (EO/IR) capabilities. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Additional funding is to design and install the prototype and proof for CROWS aboard the LCU 2000 fleet.					
Title: Army Watercraft Program Support ***Description:*** Matrix Salary Support includes Program Management and System Engineering resources required to manage the program projects and provide contractor oversight. It also includes benefits, travel, personnel training and other Government costs required to retain a professional acquisition workforce. ***FY 2020 Plans:*** Will provide MWT Engineering test support as well as engineering and Naval support for the Fleet. ***FY 2021 Base Plans:*** Provide MWT Engineering test support as well as engineering and Naval support for the Fleet. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase due to additional ongoing test support requirements from FY 2019 to FY 2021.	0.642	0.278	0.300	-	0.300
Title: Trade Studies and Business Analyses ***Description:*** Conduct Affordability and Feasibility Studies for concept development concept development for future vessel platforms. ***FY 2020 Plans:*** Support the following Feasibility Studies for future vessel platforms: Initiation of human factor engineer analysis and initiation of electrical power studies to support Command, Control, Communications, Computers,	-	1.008	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Intelligence, Surveillance and Reconnaissance (C4ISR) upgrades and joint operation capabilities for legacy vessels. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in budget affects the ability to properly fund the trade studies and analysis of future vessel platforms.					
Title: Electro-Optical / Infrared (EO/IR) Integration Kits ***Description:*** Requirement is on hold for FY 2020 -FY 2021. Funding will be moved to MWT - At Sea Transfer requirement. Integration of EO/IR maritime infrared imaging system for maritime use on LSV and LCU vessels. The EO/IR capability greatly increases the ability for the vessel crews to identify and track smugglers, terrorists, or any other threat day and night that they encounter. ***FY 2020 Plans:*** N/A Base RDTE funds. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Development of A-kit integration designs on the LSV and LCU in FY 2020. No further design requirements in FY 2021.	-	1.063	-	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	0.132	-	-	-
Accomplishments/Planned Programs Subtotals	3.766	4.001	0.840	-	0.840

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• MA4501: *MODIFICATION KITS*	15.693	48.821	19.386	-	19.386	19.819	21.331	7.385	10.849	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• MA4502: *INSTALLATION OF MODIFICATIONS*	12.306	18.438	5.251	-	5.251	4.506	4.718	4.584	4.633	Continuing	Continuing
• M11101: *Army Watercraft Esp*	8.508	35.194	40.910	-	40.910	36.608	33.922	30.510	30.511	0.000	216.163
• ML5355: *Items Less Than $5.0M (Float/Rail)*	9.385	6.920	1.844	-	1.844	-	9.933	22.697	17.702	0.000	68.481

Remarks

FY 2019 Accomplishments:
-Completed CDR for MWT/CF SLEP.
-Continue Escalation of Force (EOF) development on LSV 7 Class CROWS.
-Approved ECP MWO for EOF (development) LSV 1 Class CROWS.
-Completed identification of Environmental Compliance Technologies IAW evolving statutory and regulatory requirements.

D. Acquisition Strategy

Leverage government and public research centers Ground Vehicle Systems Center (GVSC), Naval Surface Warfare Center (NSWC) Philadelphia, AWS System Technical Support (STS) contractor (McKean Defense) and known public research institutes (Battelle) along with associated contract mechanisms to prototype, test, and evaluate component technologies that may be applicable to the current and future Army Watercraft fleet.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.132		-		-		-	0.000	0.132	-
		Subtotal	-	-		0.132		-		-		-	0.000	0.132	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Force Protection, Escalation of Force (EoF) Development (i.e. CROWS)	MIPR	TARDEC : Warren, MI	3.268	-		0.478	Feb 2020	0.445	Nov 2020	-		0.445	Continuing	Continuing	-
At Sea Transfer Systems (Modular Warping Tug / Causeway Ferry)	SS/CPFF	TARDEC DTIC - I, Battelle : Fort Belvoir, VA	4.374	3.124	Feb 2019	1.004	Nov 2019	-		-		-	0.000	8.502	-
Environmental Compliance Uniform National Discharge Standards (UNDS)	MIPR	Carderock : Maryland and Pennsylvania	3.281	-		0.038	Dec 2019	0.095	Nov 2020	-		0.095	Continuing	Continuing	-
Trade Study Analyses	TBD	TBD : TBD	-	-		1.008	Feb 2020	-		-		-	0.000	1.008	-
EO/IR Integration	MIPR	TARDEC : Warren, MI	-	-		1.063	Oct 2019	-		-		-	0.000	1.063	-
		Subtotal	10.923	3.124		3.591		0.540		-		0.540	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Watercraft Program Support	MIPR	Detroit Arsenal PMs, TARDEC, NAVSEA Carderock :	1.427	0.642	Dec 2018	0.278	Dec 2019	0.300	Dec 2020	-		0.300	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** 526 / *Marine Orien Log Eq Ad*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Maryland, Warren, MI													
		Subtotal	1.427	0.642		0.278		0.300		-		0.300	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.350	3.766		4.001		0.840		-		0.840	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** 526 / *Marine Orien Log Eq Ad*

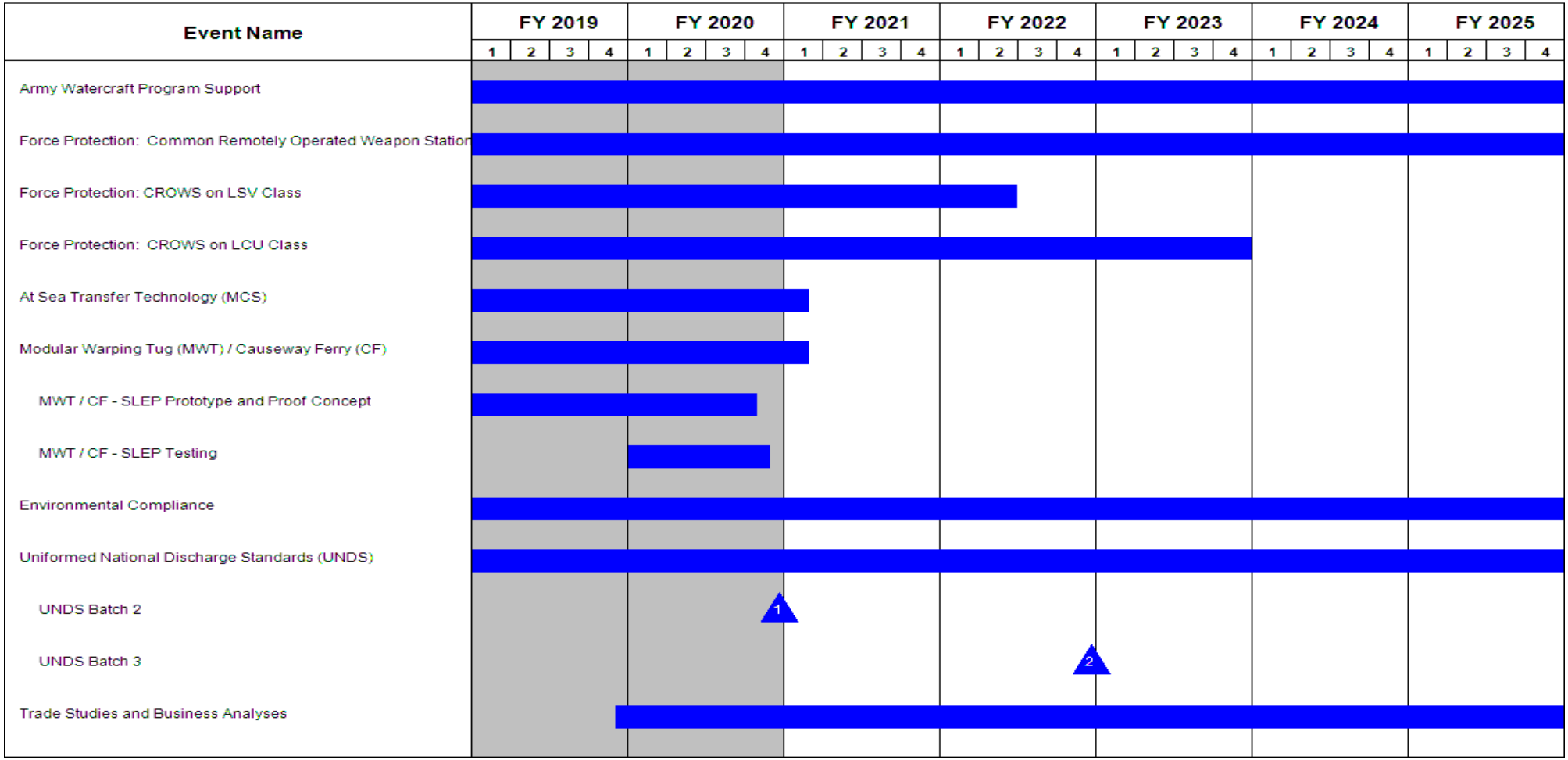

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** 526 / *Marine Orien Log Eq Ad*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Army Watercraft Program Support	1	2018	4	2025
Force Protection: Common Remotely Operated Weapon Station (CROWS)	1	2018	4	2025
Force Protection: CROWS on LSV Class	1	2018	2	2022
Force Protection: CROWS on LCU Class	1	2018	4	2023
At Sea Transfer Technology (MCS)	1	2018	1	2021
Modular Warping Tug (MWT) / Causeway Ferry (CF)	1	2018	1	2021
MWT / CF - SLEP Development Contract	4	2018	4	2018
MWT / CF - SLEP Prototype and Proof Concept	1	2018	4	2020
MWT / CF - SLEP Testing	1	2020	4	2020
Environmental Compliance	1	2018	4	2025
Uniformed National Discharge Standards (UNDS)	1	2018	4	2025
UNDS Batch 2	4	2020	4	2020
UNDS Batch 3	4	2022	4	2022
Trade Studies and Business Analyses	4	2019	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) EW8 / *Armored Engineer Vehicles*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EW8: *Armored Engineer Vehicles*	-	3.506	0.000	3.921	-	3.921	4.995	0.000	0.000	0.000	0.000	12.422
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY2021.

FY 2021 funding in the amount of $3.921 million supports a new start effort to develop a robotic capability for Armored Engineer Vehicles.

A. Mission Description and Budget Item Justification

This project supports a new start effort for the prototype development, test and evaluation of a robotic capability Remote Control System (RCS) for the Assault Breacher Vehicle (ABV), to include prototype fabrication, developmental testing, operational testing and logistics demonstration / user test events. This project also supports live fire test and evaluation, initial operational test and evaluation and production qualification testing of the Joint Assault Bridge (JAB).

Funding supports modernization of Army Bridging and Armored Engineer Vehicle fleets by investigating technology insertions including, but not limited to: condition based maintenance, increased military load capacities, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes and testing to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Assault Breacher Vehicle (ABV) Remote Control System (RCS)	-	-	3.921	-	3.921
FY 2021 Base Plans: New start effort. Funding supports prototype development and fabrication of a Remote Control System (RCS) capability for the Assault Breacher Vehicle (ABV). Funding also provides for Systems Engineering Project Management (SEPM) matrix functional support. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2020 to FY 2021 increase due to first year of RDT&E funding for ABV RCS program. New start effort.					
Title: Joint Assault Bridge (JAB)	2.221	-	-	-	-
Description: This effort funds the development and testing of the Joint Assault Bridge (JAB). The JAB provides the Army Mobility Augmentation Companies (MACs) and Armor Brigade Combat Teams (ABCTs) Brigade					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** EW8 / *Armored Engineer Vehicles*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Engineer Battalions (BEBs) with a survivable, deployable and sustainable heavy assault bridging capability. The JAB System will provide a Gap Crossing Capability to cross wet or dry gaps and provide freedom of maneuver on the battlefield and keep pace with Abrams ABCT operations.					
Title: Armored Mobile Earthmover (AME) ***Description:*** This effort funds the development and testing of the Armored Mobile Earthmover (AME). AME will replace the M9 Armored Combat Earthmover and will be primarily a mobility asset, enabling maneuver units during attacks and movements to contact. The AME will provide hasty survivability and counter-mobility capabilities to the maneuver units until more survivability and counter-mobility assets can move forward to support the maneuver force?s defenses. It will operate with primarily medium and heavy mechanized forces but will be capable of supporting all combat forces and the full range of military operations.	1.285	-	-	-	-
Accomplishments/Planned Programs Subtotals	3.506	-	3.921	-	3.921

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• GZ3001: *Joint Assault Bridge*	119.147	205.517	142.178	-	142.178	143.054	220.376	245.365	196.252	Continuing	Continuing
• G82925: *Assault Breacher Vehicle*	62.107	31.697	19.500	-	19.500	26.171	26.041	1.171	-	Continuing	Continuing

Remarks

D. Acquisition Strategy

Funding will support RDT&E efforts for testing and follow-on production of Assault Bridging system. The Assault Breacher Vehicle (ABV) Remote Control System (RCS) program will pursue a competitive prototype development and testing strategy with multiple vendors to select an RCS materiel solution for production and integration into the ABV system.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Functional Support	MIPR	Various : Various	0.779	0.150	Oct 2018	-		0.500	Dec 2020	-		0.500	0.000	1.429	-
		Subtotal	0.779	0.150		-		0.500		-		0.500	0.000	1.429	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AME Analysis of Alternatives (AOA)	C/FFP	TBD : TBD	-	1.285	Jan 2019	-		-		-		-	0.000	1.285	-
JAB Force Protection Development and Fabrication	SS/FFP	DRS SUSTAINMENT SYSTEMS, INC. : SAINT LOUIS, MO	2.084	-		-		-		-		-	0.000	2.084	-
ABV RCS Prototype Development and Fabrication	TBD	TBD : TBD	-	-		-		3.421	May 2021	-		3.421	0.000	3.421	-
		Subtotal	2.084	1.285		-		3.421		-		3.421	0.000	6.790	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
JAB Initial Operational Test & Evaluation (IOTE)	MIPR	Operational Test Command : Ft. Hood, TX	3.143	2.071	Feb 2020	-		-		-		-	0.000	5.214	-
JAB Production Qualification Testing (PQT)	MIPR	Aberdeen Test Center : Aberdeen Proving Grounds, MD	3.936	-		-		-		-		-	0.000	3.936	-
JAB Prototype Live Fire Validation	MIPR	Aberdeen Test Center : Aberdeen	1.500	-		-		-		-		-	0.000	1.500	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) EW8 / *Armored Engineer Vehicles*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Proving Grounds, MD													
JAB Logistics Demonstration	TBD	Army Operational Test Command (AOTC) : Ft. Hood, TX	0.270	-		-		-		-		-	0.000	0.270	-
		Subtotal	8.849	2.071		-		-		-		-	0.000	10.920	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	11.712	3.506		0.000		3.921		-		3.921	0.000	19.139	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** EW8 / *Armored Engineer Vehicles*

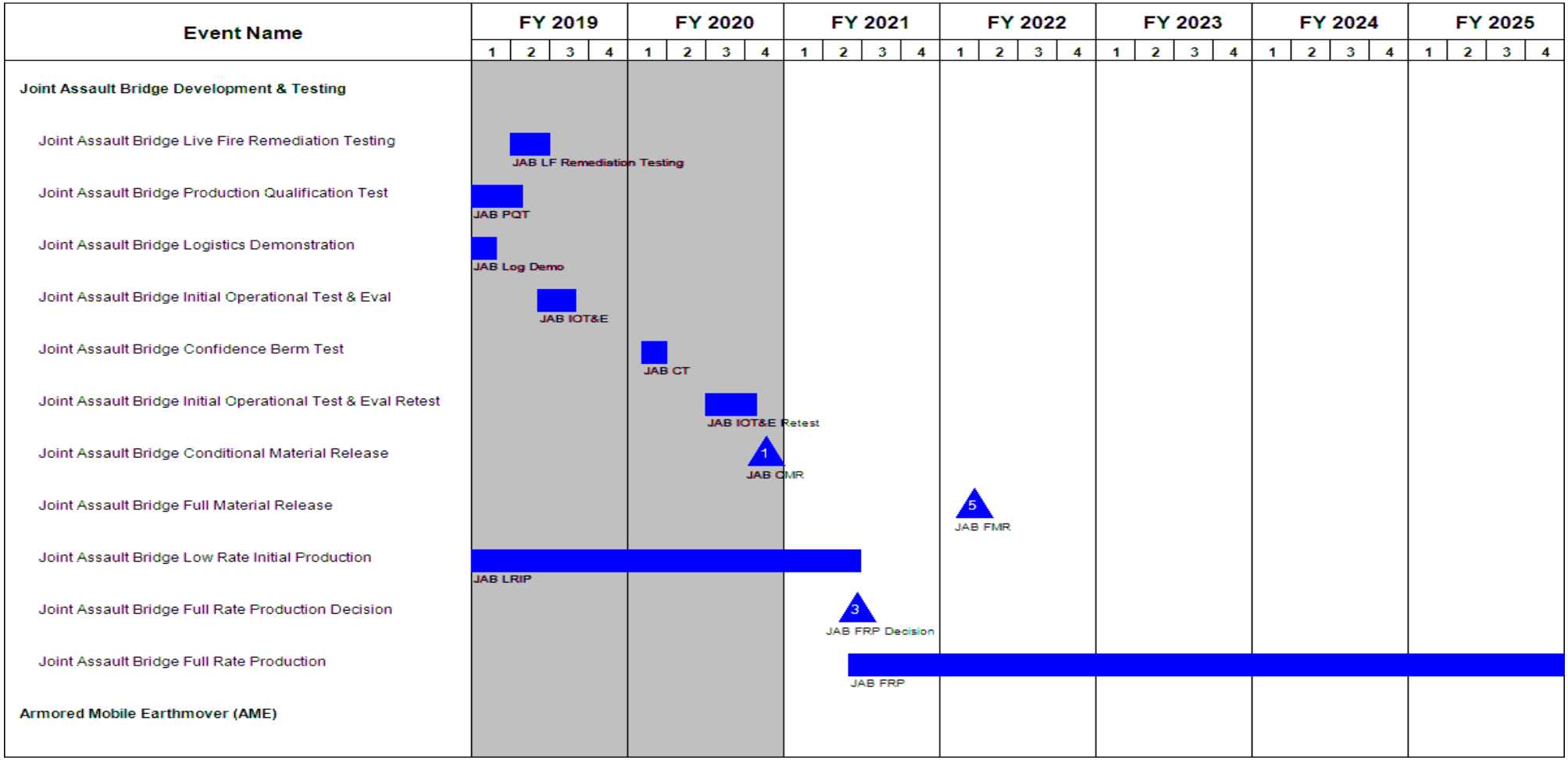

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** EW8 / *Armored Engineer Vehicles*

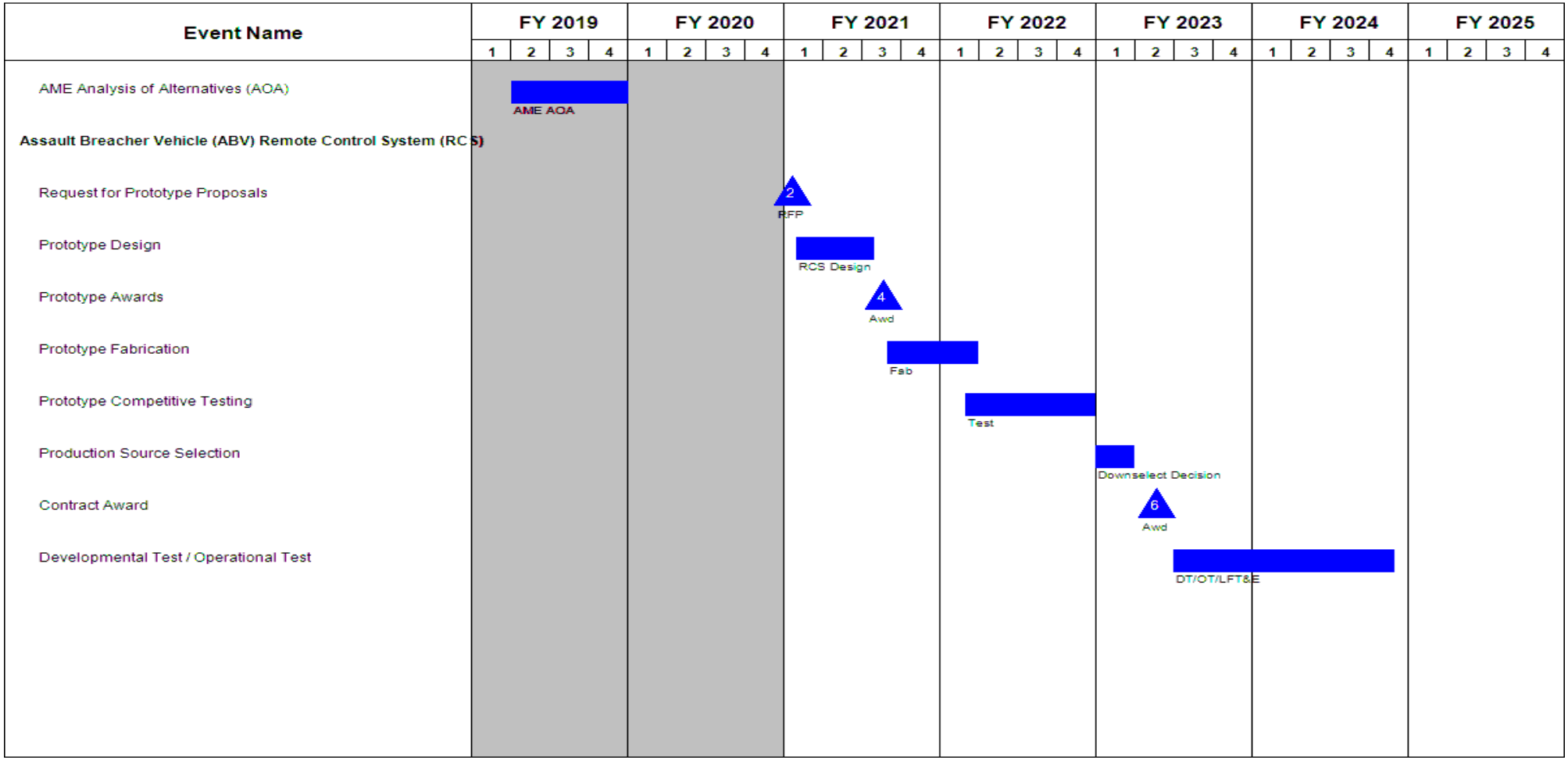

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** EW8 / *Armored Engineer Vehicles*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Joint Assault Bridge Development & Testing	1	2016	1	2019
Joint Assault Bridge Live Fire Remediation Testing	1	2019	2	2019
Joint Assault Bridge Production Qualification Test	2	2018	1	2019
Joint Assault Bridge Logistics Demonstration	4	2018	1	2019
Joint Assault Bridge Initial Operational Test & Eval	2	2019	3	2019
Joint Assault Bridge Confidence Berm Test	1	2020	1	2020
Joint Assault Bridge Initial Operational Test & Eval Retest	3	2020	4	2020
Joint Assault Bridge Conditional Material Release	4	2020	4	2020
Joint Assault Bridge Full Material Release	1	2022	1	2022
Joint Assault Bridge Low Rate Initial Production	3	2016	2	2021
Joint Assault Bridge Full Rate Production Decision	2	2021	2	2021
Joint Assault Bridge Full Rate Production	2	2021	4	2026
Armored Mobile Earthmover (AME)	1	2018	4	2026
AME Analysis of Alternatives (AOA)	2	2019	4	2019
Assault Breacher Vehicle (ABV) Remote Control System (RCS)	1	2021	2	2026
Request for Prototype Proposals	1	2021	1	2021
Prototype Design	1	2021	3	2021
Prototype Awards	3	2021	3	2021
Prototype Fabrication	3	2021	1	2022
Prototype Competitive Testing	1	2022	4	2022
Production Source Selection	1	2023	1	2023
Contract Award	2	2023	2	2023

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** EW8 / *Armored Engineer Vehicles*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Developmental Test / Operational Test	3	2023	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) G11 / *Adv Elec Energy Con Ad*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
G11: *Adv Elec Energy Con Ad*	-	6.224	3.338	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.562
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project supports the Army Network Modernization Strategy Line of Effort #4, Command Post (CP). The technologies in this portfolio are specifically designed to target CP challenges to enable power resilience across the operational spectrum and to resolve issues with setup and tear-down times and with the CP mobility and footprint. Additionally, this project supports enablers of the Integrated Visual Augmentation System (IVAS) which is a priority technology for the Network and Soldier Lethality CFT's.

As the DoD's Lead Standardization Activity for Tactical Electric Power (TEP), Project Manager Expeditionary Energy & Sustainment Systems (PM E2S2) matures and integrates technology that will improve the next generation of standard tactical power sources in support of all Services. It supports technical maturation of TEP systems that will extend Army operational mission reach and duration in support of the Army Operating Concept and Multi-Domain Battle.

Funding supports modernization of the current Tactical Electric Power capability with technology insertions including, but not limited to hybrid capabilities, light-weight power solutions, vehicle/tactical microgrid interoperability and Tactical Microgrid Standards (TMS). Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment an operational energy concepts.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Contract Activity ***Description:*** Continue maturation and integration of technology supporting the STEP, CPI2 and PDISE programs. ***FY 2020 Plans:*** Build infrastructure prototypes to enable optimized use of existing microgrid technologies. Build prototypes to integrate command post vehicle power with Tactical Electric Power systems. Build prototypes to validate feasibility of integrating energy storage with existing TEP systems to address areas of efficiency, reliability, and footprint. Perform front end analysis to assess viability of forward-deployed, mobile nuclear power plants. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY 2021 there is no RDT&E funding planned for project G11 with a subsequent transition to production.	-	0.582	-	-	-
Title: Government System Test and Evaluation	0.200	1.010	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** G11 / *Adv Elec Energy Con Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: Supports in house and external performance tests of concept hardware. In addition, supports evaluation of systems at Network Integration Evaluation (NIE) and evaluation of systems at larger events such as Army Expeditionary Warrior Experiment (AEWE) and Joint Warfighting Assessment (JWA). ***FY 2020 Plans:*** Test and evaluate government developed hybrid architectures that will inform the STEP program. Validate performance of developed prototypes to identify and reduce risks of select technology elements of the STEP program. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY 2021 there is no RDT&E funding planned for project G11 with a subsequent transition to production.					
Title: Other Contracts and Government agencies ***Description:*** Matrix engineering and analysis support for continued development of technology supporting the STEP program, PDISE, and CPI2, as well as analysis and data management. ***FY 2020 Plans:*** Support partnering efforts of power stakeholders including other services and other Army program offices. Provide support to Army demonstrations and exercises to evaluate power technologies under development and to gather Soldier feedback. System technologies will include hybrid and storage integrated in tactical electric power systems and determining definition of interfaces and test methodologies for implementation of TMS. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY 2021 there is no RDT&E funding planned for project G11 with a subsequent transition to production.	4.389	1.372	-	-	-
Title: Government Program Management ***Description:*** Continue development of technology supporting the STEP program, PDISE and CPI2. ***FY 2020 Plans:*** Continue oversight and management of various technology projects related to Tactical Electric Power and power distribution/management across the DoD power spectrum. Specific efforts will include support of CPI2, missile defense systems, and other Army power consumers. Additional efforts include communicating power-related capability gaps and associated solutions across DoD and to OSD energy offices. ***FY 2020 to FY 2021 Increase/Decrease Statement:***	1.635	0.222	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** G11 / *Adv Elec Energy Con Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
In FY 2021 there is no RDT&E funding planned for project G11 with a subsequent transition to production.					
Title: FY 2020 SBIR/STTR Transfer	-	0.152	-	-	-
Description: Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638					
Accomplishments/Planned Programs Subtotals	6.224	3.338	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 194: *Engine Driven Gen Ed*	1.743	8.395	10.655	-	10.655	12.852	13.150	6.804	7.115	0.000	60.714
• MA9800: *Generators And Associated Equip*	136.906	115.912	53.433	0.106	53.539	61.474	61.630	65.220	54.980	0.000	549.661

Remarks

D. Acquisition Strategy

Complete advanced development pre-Milestone B technology assessments and analysis, and transition products to Engineering and Manufacturing Development (EMD) phase (Milestone B) and subsequent transition to production (Milestone C). Support concept development and demonstration efforts. Products and technologies supported include tactical power and energy sources, alternative/renewable energy systems, power distribution components, and power management and distribution control systems. Perform analysis of Operational Energy related impacts to future development programs to better direct United States Army Combat Capabilities Development Command (CCDC) efforts.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) G11 / *Adv Elec Energy Con Ad*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platoon Power Generation	MIPR	PM E2S2 : Ft. Belvoir, VA	0.100	-		-		-		-		-	Continuing	Continuing	Continuing
Small Tactical Electric Power (STEP) Components	MIPR	PM E2S2 : Fort Belvoir, VA	0.815	0.175		0.040		-		-		-	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	PM E2S2 : Ft. Belvoir, VA	0.692	0.250		0.077		-		-		-	Continuing	Continuing	Continuing
Power Management and Distribution Systems	MIPR	PM E2S2 : Ft. Belvoir, VA	1.633	0.250		0.101		-		-		-	Continuing	Continuing	Continuing
Operational Energy	MIPR	PM E2S2 : Fort Belvoir, VA	1.660	0.150		-		-		-		-	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.152		-		-		-	0.000	0.152	-
		Subtotal	4.900	0.825		0.370		-		-		-	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platoon Power Generation	MIPR	CERDEC : Fort Belvoir, VA	0.750	-		-		-		-		-	Continuing	Continuing	Continuing
Small Tactical Electric Power (STEP) Components	Various	CERDEC : Fort Belvoir, VA	4.031	0.300		0.090		-		-		-	Continuing	Continuing	Continuing
Hybrid Power Sources Components	Various	Multiple Vendors : TBD	2.675	0.200		0.170		-		-		-	Continuing	Continuing	Continuing
Power Management and Distribution Systems	Various	CERDEC : Fort Belvoir, VA	5.347	0.589		0.320		-		-		-	Continuing	Continuing	Continuing
Operational Energy	TBD	TBD : TBD (FY15)	2.909	0.249		-		-		-		-	Continuing	Continuing	Continuing
Metering and Monitoring Demo	Various	TBD : TBD	0.455	-		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	16.167	1.338		0.580		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** G11 / *Adv Elec Energy Con Ad*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Small Tactical Electric Power (STEP) Components	MIPR	CERDEC : Fort Belvoir, VA	1.874	0.385		0.236		-		-		-	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	CERDEC : Fort Belvoir, VA	1.819	-		0.436		-		-		-	Continuing	Continuing	Continuing
Power Management and Distribution Control Systems	MIPR	CERDEC : Fort Belvoir, VA	1.860	0.376		0.696		-		-		-	Continuing	Continuing	Continuing
Platoon Power Generation	MIPR	CERDEC : Fort Belvoir, VA	0.101	-		-		-		-		-	Continuing	Continuing	Continuing
Modular Power	MIPR	Idaho National Labs; Air Force Civil Engineer Center : xxxx	-	3.000		-		-		-		-	Continuing	Continuing	Continuing
Operational Energy	MIPR	Dept of Energy Sandia National Labs : Washington DC	1.757	0.100		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	7.411	3.861		1.368		-		-		-	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platoon Power Generation (PPG)	MIPR	CERDEC : Fort Belvoir, VA	0.250	-		-		-		-		-	Continuing	Continuing	Continuing
Small Tactical Electric Power (STEP) Components	MIPR	CERDEC : Fort Belvoir, VA	1.330	0.200		0.439		-		-		-	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	CERDEC : Fort Belvoir, VA	0.829	-		0.581		-		-		-	Continuing	Continuing	Continuing
Power Management and Distribution Systems	MIPR	CERDEC : Fort Belvoir, VA	2.011	-		-		-		-		-	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) G11 / *Adv Elec Energy Con Ad*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	4.420	0.200		1.020		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.898	6.224		3.338		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** G11 / *Adv Elec Energy Con Ad*

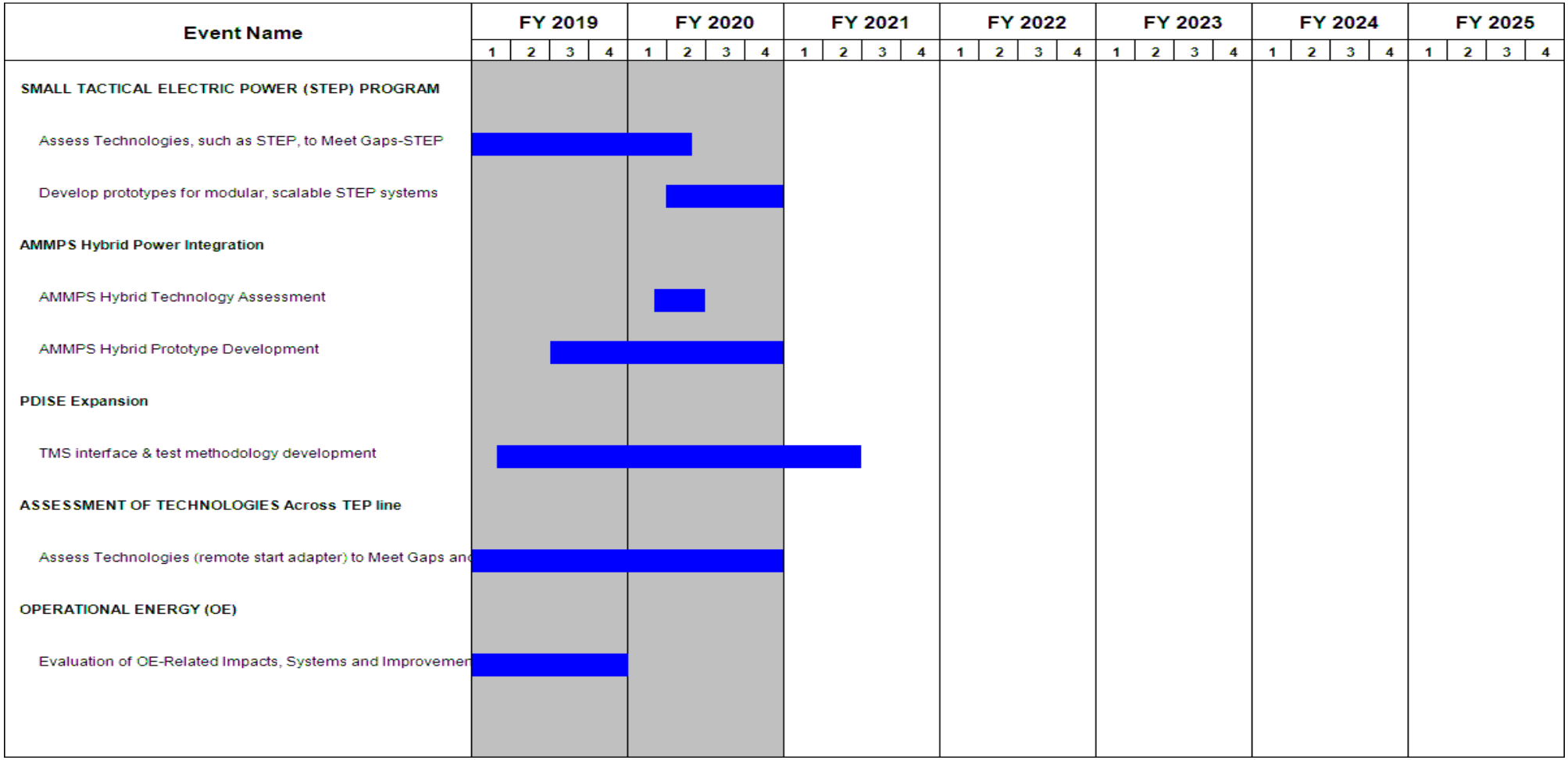

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** G11 / *Adv Elec Energy Con Ad*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
SMALL TACTICAL ELECTRIC POWER (STEP) PROGRAM	1	2016	4	2020
Assess Technologies, such as STEP, to Meet Gaps-STEP	1	2016	2	2020
Develop prototypes for modular, scalable STEP systems	2	2020	4	2020
AMMPS Hybrid Power Integration	1	2020	2	2020
AMMPS Hybrid Technology Assessment	1	2020	2	2020
AMMPS Hybrid Prototype Development	3	2019	4	2020
PDISE Expansion	1	2017	2	2021
TMS interface & test methodology development	1	2019	2	2021
ASSESSMENT OF TECHNOLOGIES Across TEP line	1	2017	4	2020
Assess Technologies (remote start adapter) to Meet Gaps and Improve Efficiencies	1	2017	4	2020
OPERATIONAL ENERGY (OE)	1	2016	4	2019
Evaluation of OE-Related Impacts, Systems and Improvements	1	2016	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) K39 / *Field Sustainment Support Ad*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
K39: *Field Sustainment Support Ad*	-	2.234	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.234
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project K39 completes in FY19

A. Mission Description and Budget Item Justification

This Project supports development of critical cargo aerial delivery capabilities. These systems will fill identified theater distribution and services capability gaps, improve unit sustainability, and increase combat effectiveness. This Project supports Advanced Component Development and Prototyping of Critical Distribution Capabilities which provide improved safety and accuracy while increasing survivability of aircraft, personnel, and equipment. This Project develops critical enablers that support the Army in executing future movement and maneuver operations and distributed sustainment support by maintaining readiness through fielding and integrating new equipment. This Project also ensures Army Expeditionary Forces are capable of rapid deployment through aerial delivery initiatives and reduces sustainment requirements, related Combat Support/Combat Service Support (CS/CSS) demands in lift, combat zone footprint, and costs for logistical support.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Rapid Rigging and DeRigging Airdrop System (RRDAS) Phase I ***Description:*** Effort to reduce rigging times while also providing the capability to rapidly de-rig loads on the drop zone. This will reduce the lead time to prepare Low Velocity Airdrop System (LVADS) loads while also increasing the survivability of receiving ground forces by ensuring the airdrop loads (to include weapon systems, prime movers, trailers, etc.) are quickly de-rigged and made operational. RRDAS is a three phase Research, Development, Testing and Engineering (RDT&E) effort, Phase I will focus on loads up to 20,000 pounds and platform lengths up to 20 feet and will include prime movers such as HMMWV.	1.279	-	-	-	-
Title: Advanced Low Velocity Airdrop System (ALVADS) - Light and Heavy/ Dual Row Airdrop System (DRAS) Application ***Description:*** ALVADS provides the ability to drop equipment at 500 feet and can handle the extreme opening shocks associated with heavy equipment drops at low altitudes and the ability to quickly de-rig equipment on the battlefield.	0.955	-	-	-	-
Accomplishments/Planned Programs Subtotals	2.234	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** K39 / *Field Sustainment Support Ad*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• MA7806: *Precision Airdrop*	5.731	2.040	0.000	2.040	2.040	-	-	-	-	0.000	9.811
• L39: *Field Sustainment Support Ed*	2.674	1.675	1.718	-	1.718	1.771	1.805	1.798	1.798	0.000	13.239

Remarks

D. Acquisition Strategy

Conduct pre-Engineering and Manufacturing Development (EMD) advanced component development to reduce risk prior to entering EMD phase.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) K39 / *Field Sustainment Support Ad*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support	Various	PMFSS : Natick, MA	7.010	0.202		-		-		-		-	0.000	7.212	-
		Subtotal	7.010	0.202		-		-		-		-	0.000	7.212	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Extracted High and Low Speed Container Delivery System (EHLSCDS)	Various	Various : Various	1.861	-		-		-		-		-	0.000	1.861	-
ALVADS-L/H DRAS	Various	Various : Various	0.937	-		-		-		-		-	0.000	0.937	-
JPADS Block 1 upgrade	Various	Various : Various	16.434	-		-		-		-		-	0.000	16.434	-
Rapid Rigging/Derigging	Various	Various : Various	0.495	0.250		-		-		-		-	0.000	0.745	-
Advanced Low Velocity Airdrop System-L/H	Various	Various : Various	1.300	0.293		-		-		-		-	0.000	1.593	-
		Subtotal	21.027	0.543		-		-		-		-	0.000	21.570	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
JPADS Block 1 upgrade	Various	Various : Various	0.110	-		-		-		-		-	0.000	0.110	-
ALVADS-L/H DRAS	Various	Various : Various	0.300	-		-		-		-		-	0.000	0.300	-
Rapid Riggind/DeRigging	Various	Various : Various	0.200	-		-		-		-		-	0.000	0.200	-
		Subtotal	0.610	-		-		-		-		-	0.000	0.610	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) K39 / *Field Sustainment Support Ad*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALVADS-L/H DRAS	Various	YPG, AZ : YPG, AZ	0.500	-		-		-		-		-	0.000	0.500	-
Extracted High and Low Speed Container Delivery System (EHLSCDS)	Various	YPG, AZ : YPG, AZ	1.000	-		-		-		-		-	0.000	1.000	-
JPADS Block 1 upgrade	Various	YPG, AZ : YPG, AZ	0.950	-		-		-		-		-	0.000	0.950	-
Rapid Rigging/DeRigging	Various	Various : Various	0.200	0.739		-		-		-		-	0.000	0.939	-
Advanced Low Velocity Airdrop System	Various	Various : Various	-	0.750		-		-		-		-	0.000	0.750	-
		Subtotal	2.650	1.489		-		-		-		-	0.000	4.139	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	31.297	2.234		0.000		-		-		-	0.000	33.531	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** K39 / *Field Sustainment Support Ad*

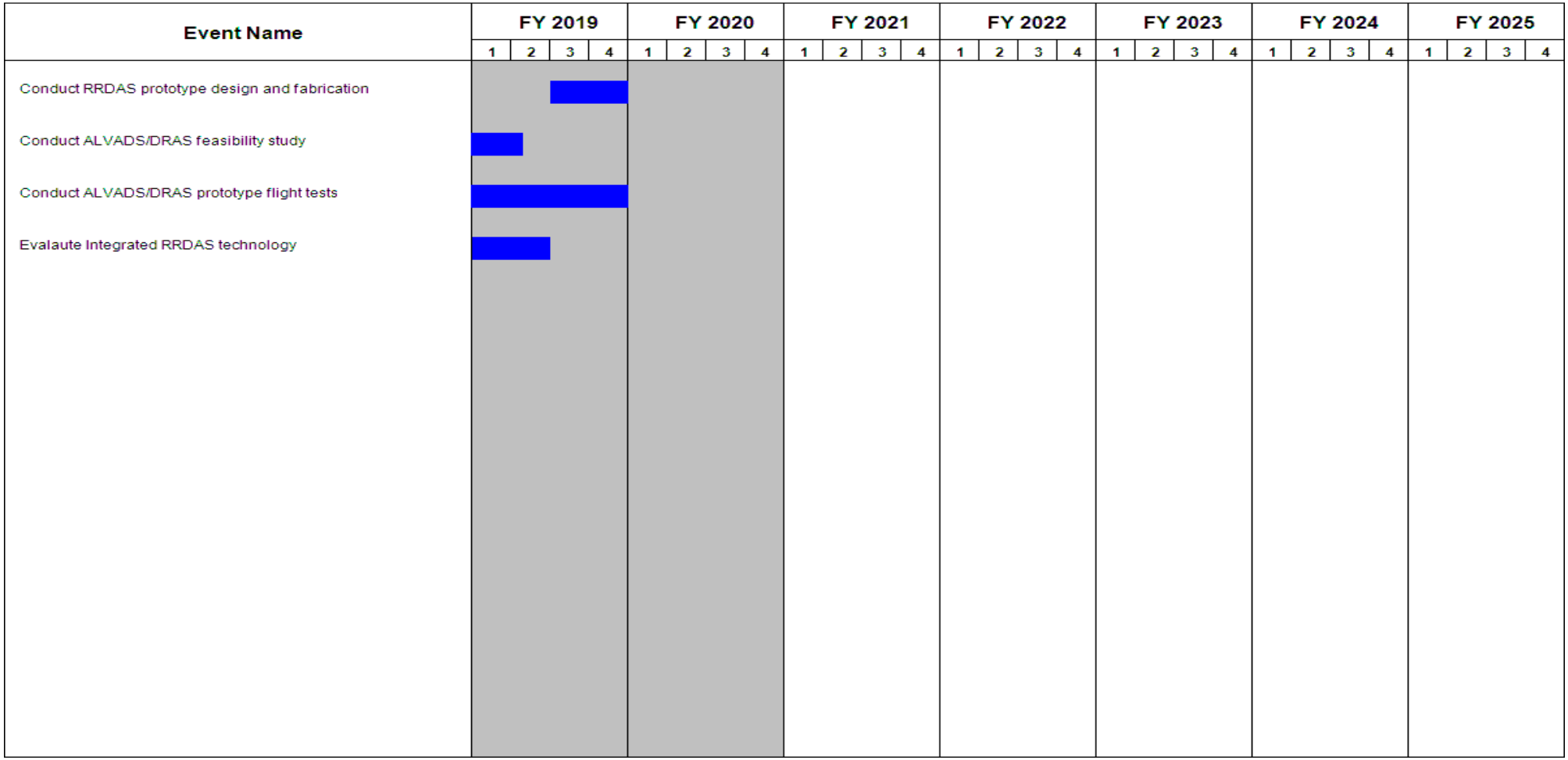

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** K39 / *Field Sustainment Support Ad*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Conduct RRDAS prototype design and fabrication	3	2019	4	2019
Conduct ALVADS/DRAS feasibility study	3	2017	1	2019
Conduct ALVADS/DRAS baseline evaluations	2	2018	3	2018
Conduct ALVADS/DRAS prototype flight tests	3	2018	4	2019
Evalaute Integrated RRDAS technology	1	2019	2	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) VR8 / *Combat Service Support Systems - Ad*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VR8: *Combat Service Support Systems - Ad*	-	3.115	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.115
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project VR8 completes in FY 2019

A. Mission Description and Budget Item Justification

This Project supports Advanced Component Development and Prototyping of critical soldier support and sustainment systems that provide more endurance and agility to combat operations enabling success of Army Expeditionary Forces in future multi-domain scenarios. Project includes shelter systems (rigid and soft wall), expeditionary base camp subsystems, field service systems, mortuary affairs equipment, field heaters, and other combat service support equipment. These systems will fill identified theater capability gaps, improve unit sustainability, improve resource and energy efficiency and increase combat effectiveness. This Project supports Advanced Component Development and Prototyping of critical tactical support systems that support mobile Joint Service command and control, medical, and maintenance platforms. This Project develops critical enablers that support the Army Campaign Plan and Army Modernization Strategy by maintaining readiness through fielding and integrating new equipment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Resource and Energy Efficiency Enabling Solutions ***Description:*** Reduces the resource, operational energy and logistics footprint of critical soldier support and sustainment systems while maintaining or improving operational effectiveness. The goal is to significantly reduce fuel, water, and power requirements to sustain multi-domain operations in addition to reducing maintenance and spare parts requirements. Systems such as Command Posts, Expeditionary Operating Bases, and Combat Support Hospitals require a significant amount of logistics and sustainment support which cost valuable resources, require extra human effort (that means a risk in the form of Soldiers on the road), limit endurance, restrict agility, and increase vulnerability.	1.727	-	-	-	-
Title: Army Standard Family of Rigid Wall Shelters (ASF-RWS) ***Description:*** The ASF-RWS program will conduct formal development to incorporate the latest technologies into a fully supportable and modernized family. The intent is to eliminate the proliferation of non-standard shelters and their associated logistics burden, thereby reducing the lifecycle cost of RWS across the Services. The program will produce approved Technical Data Packages (TDPs) to support procurements by materiel	1.388	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** VR8 / *Combat Service Support Systems - Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
developers and Program Managers (PMs) requiring RWS. ASF-RWS procurements are customer funded by PMs as a cost under their program(s). The ASF-RWS will consist of three variants: (1) Expandable/Non-Expandable; (2) Vehicle Mounted; and (3) Panelized/Collapsible with a focus on the following features and improvements: reduced cost, reduced weight, improved energy efficiency, improved corrosion resistance, and improved transportability.					
Accomplishments/Planned Programs Subtotals	3.115	-	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• VR7: *Combat Service Support Systems*	4.837	-	0.000	-	0.000	-	-	-	-	0.000	4.837

Remarks

D. Acquisition Strategy

Evaluate integrated technologies in a realistic operational environment and transition promising efforts into Engineering and Manufacturing Development (EMD). Accelerate efficiency, standardization, and safety initiatives to incorporate in deployed systems, develop new Technical Data Packages (TDP), and/or incorporate during reset of equipment.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) VR8 / *Combat Service Support Systems - Ad*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support	Various	PM FSS : Natick, MA	2.276	0.365	Nov 2018	-		-		-		-	0.000	2.641	-
		Subtotal	2.276	0.365		-		-		-		-	0.000	2.641	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Soldier Support Equipment	Various	Various : Various	10.107	-		-		-		-		-	0.000	10.107	-
Energy Efficiency Enabling Solutions	Various	Various : Various	0.191	0.681	Jan 2019	-		-		-		-	0.000	0.872	-
Army Standard Family of Rigid Wall Shelters (ASF-RWS)	Various	Various : Various	-	1.041	Dec 2018	-		-		-		-	0.000	1.041	-
		Subtotal	10.298	1.722		-		-		-		-	0.000	12.020	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Soldier Support Equipment	Various	Various : Various	5.650	-		-		-		-		-	0.000	5.650	-
Energy Efficiency Enabling Solutions	Various	Various : Various	0.715	0.478	Feb 2019	-		-		-		-	0.000	1.193	-
Army Standard Family of Rigid Wall Shelters (ASF-RWS)	Various	Various : Various	-	0.550	Nov 2018	-		-		-		-	0.000	0.550	-
		Subtotal	6.365	1.028		-		-		-		-	0.000	7.393	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	18.939	3.115		0.000		-		-		-	0.000	22.054	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	Project (Number/Name) VR8 / *Combat Service Support Systems - Ad*	

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** VR8 / *Combat Service Support Systems - Ad*

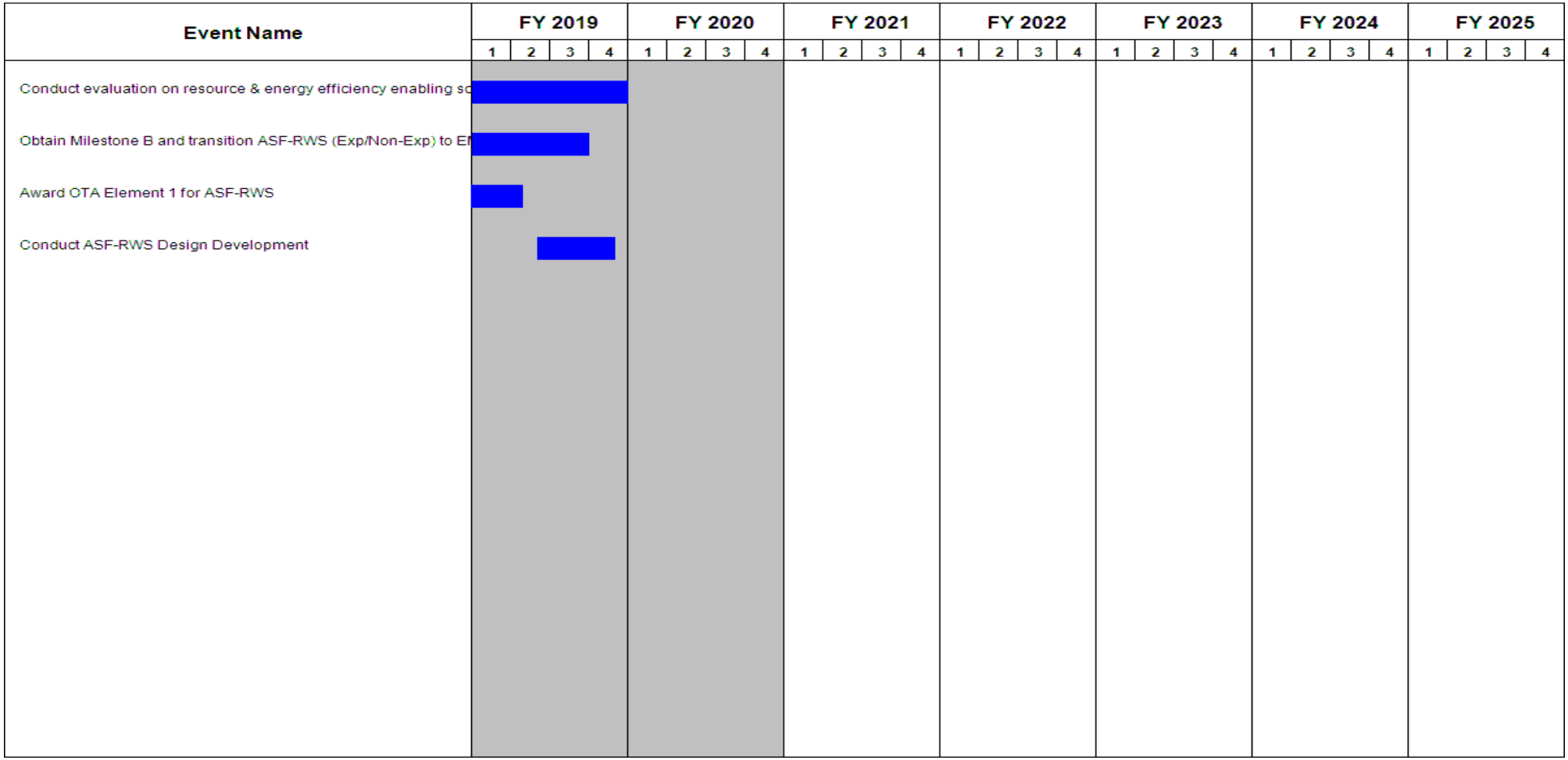

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603804A / *Logistics and Engineer Equipment - Adv Dev*	**Project (Number/Name)** VR8 / *Combat Service Support Systems - Ad*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Conduct evaluation on resource & energy efficiency enabling solutions	1	2016	4	2019
Obtain Milestone B and transition ASF-RWS (Exp/Non-Exp) to EMD	1	2019	3	2019
Award OTA Element 1 for ASF-RWS	1	2019	1	2019
Conduct ASF-RWS Design Development	2	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603807A *I Medical Systems - Adv Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	38.371	36.975	28.520	-	28.520	37.008	27.659	27.674	28.273	0.000	224.480
808: *DoD Drug & Vacc Ad*	-	11.511	11.315	10.894	-	10.894	9.995	9.344	9.494	9.709	0.000	72.262
811: *Mil HIV Vac&Drug Dev*	-	3.595	5.460	5.098	-	5.098	6.267	1.309	1.145	1.145	0.000	24.019
836: *Field Medical Systems Advanced Development*	-	15.676	14.107	12.226	-	12.226	20.435	17.006	17.035	17.419	0.000	113.904
CS4: *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*	-	5.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
FF4: *Counterdrug, DDR, Sys Development & Demonstration*	-	2.296	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.296
VS7: *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*	-	0.293	6.093	0.302	-	0.302	0.311	0.000	0.000	0.000	0.000	6.999

A. Mission Description and Budget Item Justification

This Program Element (PE) funds development of medical materiel within the early system integration portion of the System Development and Demonstration phase of the acquisition life cycle using 6.4 (Advanced Component Development and Prototype) funding. Program efforts support transition of promising Science and Technology candidate medical technologies (drugs, vaccines, medical devices, diagnostics, and mechanisms for detection and control of disease carrying insects) to larger scale testing in humans for safety and effectiveness. Programs are aligned to meet future force requirements identified within concept documents and organizational structures. This PE also provides funding for Food and Drug Administration (FDA) regulated human clinical trials to gain additional information about safety and effectiveness on the path to licensure for use in humans. These efforts are managed by U.S. Army Medical Materiel Development Activity (USAMMDA) and U.S. Army Medical Materiel Agency (USAMMA) of the U.S. Army Medical Research and Materiel Command.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603807A *I Medical Systems - Adv Dev*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	39.244	31.175	30.785	-	30.785
Current President's Budget	38.371	36.975	28.520	-	28.520
Total Adjustments	-0.873	5.800	-2.265	-	-2.265
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.800			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.873	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-2.265	-	-2.265

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: CS4: *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*		
Congressional Add: *Transport Telemedicine*	5.000	-
Congressional Add Subtotals for Project: CS4	5.000	-
Project: VS7: *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*		
Congressional Add: *Transport Telemedicine*	-	5.800
Congressional Add Subtotals for Project: VS7	-	5.800
Congressional Add Totals for all Projects	5.000	5.800

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 808 / *DoD Drug & Vacc Ad*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
808: *DoD Drug & Vacc Ad*	-	11.511	11.315	10.894	-	10.894	9.995	9.344	9.494	9.709	0.000	72.262
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project funds development of candidate medical countermeasures for infectious diseases of military relevance. These efforts are in: vaccines, drugs, diagnostic kits/ devices, and studies to determine if insects infected with pathogenic organisms are capable of infecting service members/preventive medicine measures. These funds support human clinical effectiveness (capacity to produce a desired size of an effect under ideal or optimal conditions) trials of the drug/vaccine in larger groups that are designed to assess how well the drug/vaccine works and continue safety assessments in a larger group of volunteers. Funding supports both technical evaluations and human clinical testing to assure the safety and effectiveness of medical diagnostic kits and devices. This work, which is performed in military laboratories or civilian pharmaceutical firms, is directed toward the prevention of disease, early diagnosis, and accelerated recovery time once diagnosed to enhance battlefield readiness. All clinical trials are conducted in accordance with United States (U.S.) Food and Drug Administration (FDA) regulations, a mandatory obligation for all military products placed into the hands of medical providers or service members. Product development priorities are determined based upon four major factors: (1) the extent and threat of the disease within the Combatant Commands theater of operations, (2) the clinical severity of the disease, (3) the technical maturity of the proposed solution, and (4) the affordability of the solution (development and production). Products from this Project will transition to PE 0604807A/Project 849.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: DoD Drug and Vaccine Advanced Development	11.511	10.860	10.894
Description: Funding is provided for the development of candidate medical countermeasures for military relevant infectious disease focusing on prevention, early diagnosis and accelerated recovery time. Funding supports both technical evaluations and human clinical testing to assure the safety and effectiveness of medical diagnostic kits and devices.			
FY 2020 Plans: Dengue Vaccine Block II - Will continue the clinical development of the dengue human infection model (DHIM), a tool for rapid evaluation of efficacy of dengue vaccines and therapeutics. Treatment for Resistant Wound Infections: Will monitor technical maturity of candidate treatments for evidence of safety and efficacy in relevant animal models. Malaria Chemoprophylaxis ?Tafenoquine (formerly Next Generation Malaria Prophylaxis): Will continue the retinal (eye) safety study (3 year study) started in FY 2017. Address any FDA post-marketing approval requirements.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 808 / *DoD Drug & Vacc Ad*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Rapid Diagnostic and Detection Devices (Infectious Disease Diagnostics (Multiple)) - The dengue assay transitioned to PE 0604807A Project 849 in FY 2019. The chikungunya assays will continue to be developed and evaluated. Clinical testing will be conducted for chikungunya. ***FY 2021 Plans:*** Treatment for Resistant Infections ? Antifungal Drug (formerly Treatment for Resistant Infections): Will monitor technical maturity of candidate treatments for evidence of safety and efficacy in relevant animal models. Malaria Prophylactic Drug ? Tafenoquine (TQ) (Formerly Next Generation Malaria Prophylaxis): Achieved Milestone C in FY 2019. Will continue the retinal (eye) safety study. Additional clinical sites were added. Address any FDA post-marketing approval requirements. Rapid Diagnostic and Detection Devices (Infectious Disease Diagnostics (Multiple)): The dengue assay did not transition to PE 0604807A Project 849 in FY 2019 as expected. The dengue assay will transition in FY 2020. The chikungunya assays will continue to be developed and evaluated. Clinical testing will be conducted for chikungunya. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decrease in FY 2021 to progression of product development efforts.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.455	-
Accomplishments/Planned Programs Subtotals	11.511	11.315	10.894

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Test and evaluate in-house and commercially developed products in extensive commercial partner or government-managed clinical trials to gather data required for FDA licensure and Environmental Protection Agency registration ensuring government (military) requirements are met with judicious investment.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 808 / *DoD Drug & Vacc Ad*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Management Services Cost	Various	Not Applicable : Not applicable	24.045	4.785		0.659		0.300		-		0.300	Continuing	Continuing	Continuing
Medical Product Development Management Services Cost	PO	General Dynamics Information Technology, : Frederick MD	6.988	0.730		0.709		0.700		-		0.700	0.000	9.127	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.455		-		-		-	0.000	0.455	-
		Subtotal	31.033	5.515		1.823		1.000		-		1.000	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Cost	Various	Not applicable : Not applicable	33.219	0.467		5.308		-		-		-	Continuing	Continuing	Continuing
Rapid Diagnostic and Detection Devices	C/Various	Inbios, Inc : Seattle WA	-	1.997		2.363		2.786		-		2.786	0.000	7.146	-
Treatment for Resistant Infections - Antifungal Drug	Various	TBD : TBD	-	-		-		1.993		-		1.993	0.000	1.993	-
Next Generation Malaria Drug (D5P)	Various	TBD : TBD	-	-		-		2.716		-		2.716	0.000	2.716	-
Staphylococcus aureus Vaccine	Various	TBD : TBD	-	-		-		1.818		-		1.818	0.000	1.818	-
		Subtotal	33.219	2.464		7.671		9.313		-		9.313	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Support Cost	Various	Not Applicable : Not applicable	15.721	0.425		0.042		-		-		-	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 808 / *DoD Drug & Vacc Ad*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	15.721	0.425		0.042		-		-		-	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development T&E Cost	Various	Not applicable : Not applicable	56.719	0.379		-		-		-		-	Continuing	Continuing	Continuing
Dengue Block II	IA	WRAIR and AFRIMS : Silver Spring MD	1.720	0.780		0.812		-		-		-	0.000	3.312	-
Malaria Prophylaxis Clinical Trial	TBD	TBD : TBD	9.175	1.948		0.967		0.581		-		0.581	0.000	12.671	-
		Subtotal	67.614	3.107		1.779		0.581		-		0.581	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	147.587	11.511		11.315		10.894		-		10.894	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 808 / *DoD Drug & Vacc Ad*

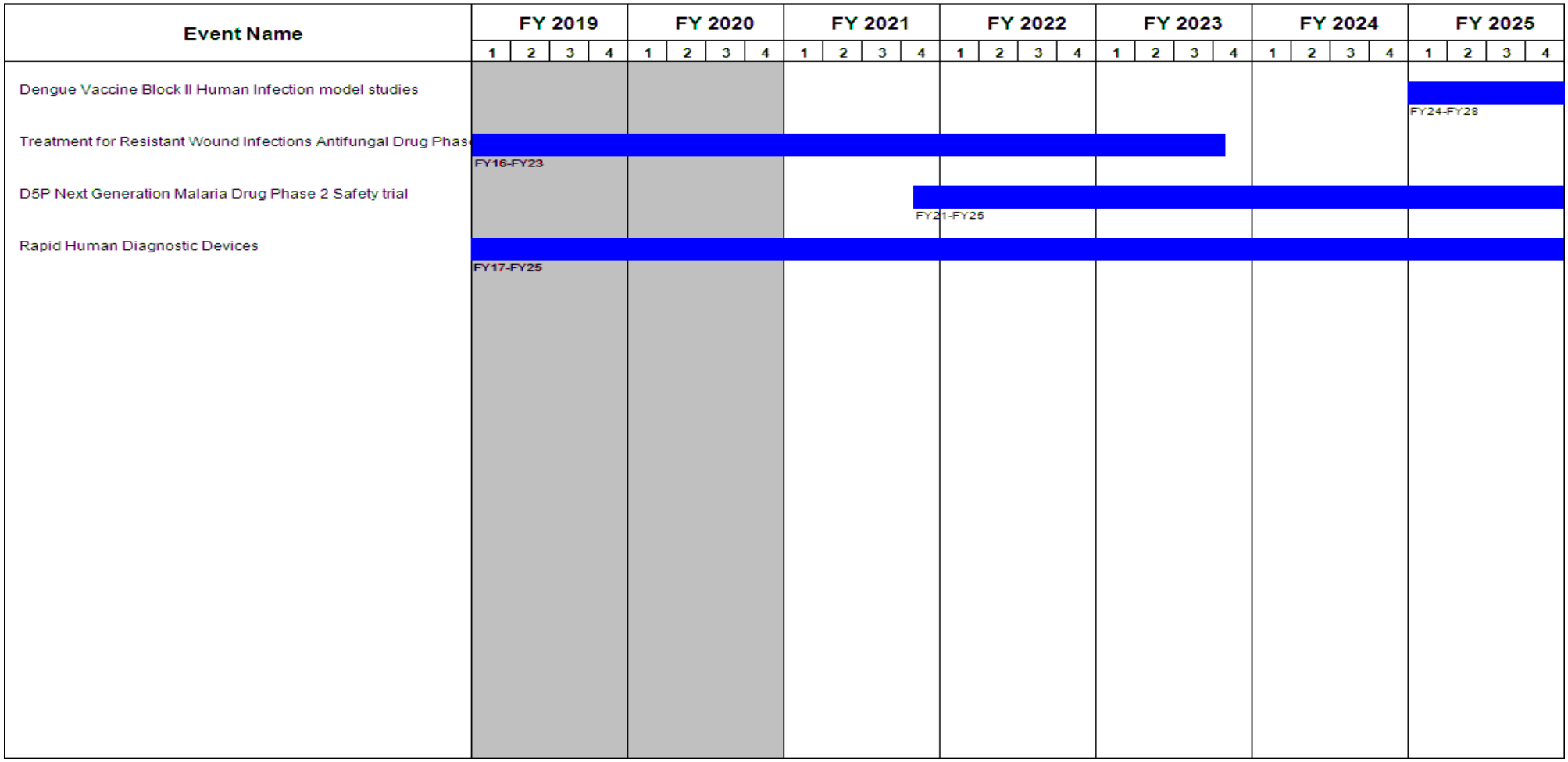

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 808 / *DoD Drug & Vacc Ad*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Dengue Vaccine Block II Human Infection model studies	1	2025	4	2028
Treatment for Resistant Wound Infections Antifungal Drug Phase 2 safety trial	1	2017	4	2023
D5P Next Generation Malaria Drug Phase 2 Safety trial	4	2021	4	2025
Rapid Human Diagnostic Devices	4	2017	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 811 / *Mil HIV Vac&Drug Dev*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
811: *Mil HIV Vac&Drug Dev*	-	3.595	5.460	5.098	-	5.098	6.267	1.309	1.145	1.145	0.000	24.019
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project funds development of militarily relevant human immunodeficiency virus (HIV) medical countermeasures. It provides for the planning and conduct of human clinical trials in a group of healthy volunteers to assess for safety and tolerability of medical countermeasures, how the drug/vaccine is distributed through, metabolized in, and excreted from the body, and to investigate the appropriate dose. Development efforts are focused on militarily unique needs affecting manning, mobilization, and deployment. The cumulative cost of treating HIV-positive DoD personnel is estimated to be $16.6 billion for 3000 personnel over a 50-year lifetime. All clinical trials are conducted in accordance with U.S. FDA regulations. Products from this Project will transition to PE 0604807A/Project 812.

Research efforts are coordinated with the National Institutes of Health and the National Institute of Allergy and Infectious Diseases (NIAID), Division of Acquired Immune Deficiency Syndrome (DAIDS).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Military HIV Vaccine & Drug Development	3.595	5.212	5.098
Description: This Project funds advanced development research to develop candidate HIV vaccines, assess their safety and effectiveness in evaluations with human subjects, and protect military personnel from risks associated with HIV infection. ***FY 2020 Plans:*** Regional Vaccine Candidate: Effort will not be funded in this BA until FY 2023 when the effort transitions to advanced development. Global Vaccine Candidate: Will continue to support clinical trial sites based on a Cooperative Research and Development Agreement (CRADA) with a commercial partner. ***FY 2021 Plans:*** Global Vaccine Candidate: Will continue to support clinical trial sites based on a Cooperative Research and Development Agreement (CRADA) with a commercial partner. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease of funding in FY 2021 was due to the projected requirements of the program.			
Title: FY 2020 SBIR/STTR Transfer	-	0.248	-
Description: Funding transferred in accordance with Title 15 USC ?638			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 811 / *Mil HIV Vac&Drug Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	3.595	5.460	5.098

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Test and evaluate commercially developed drug/vaccine candidates in government-managed trials.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 811 / *Mil HIV Vac&Drug Dev*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Management Services Cost	TBD	Not Applicable : Not Applicable	4.132	-		-		-		-		-	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.248		-		-		-	0.000	0.248	-
		Subtotal	4.132	-		0.248		-		-		-	Continuing	Continuing	N/A

Remarks

Not Applicable

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Cost	TBD	Not applicable : Not applicable	5.078	-		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	5.078	-		-		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Support Cost	TBD	TBD : TBD	3.551	0.990		-		-		-		-	0.000	4.541	-
		Subtotal	3.551	0.990		-		-		-		-	0.000	4.541	N/A

Remarks

Not Applicable

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 811 / *Mil HIV Vac&Drug Dev*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development T&E Cost	TBD	Not applicable : Not Applicable	25.599	2.605		5.212		3.848		-		3.848	0.000	37.264	-
Medical Product Development T&E Cost	C/CPFF	PPD : Wilmington, NC	-	-		-		1.250		-		1.250	0.000	1.250	-
		Subtotal	25.599	2.605		5.212		5.098		-		5.098	0.000	38.514	N/A

Remarks

Not Applicable

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	38.360	3.595		5.460		5.098		-		5.098	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 811 / *Mil HIV Vac&Drug Dev*

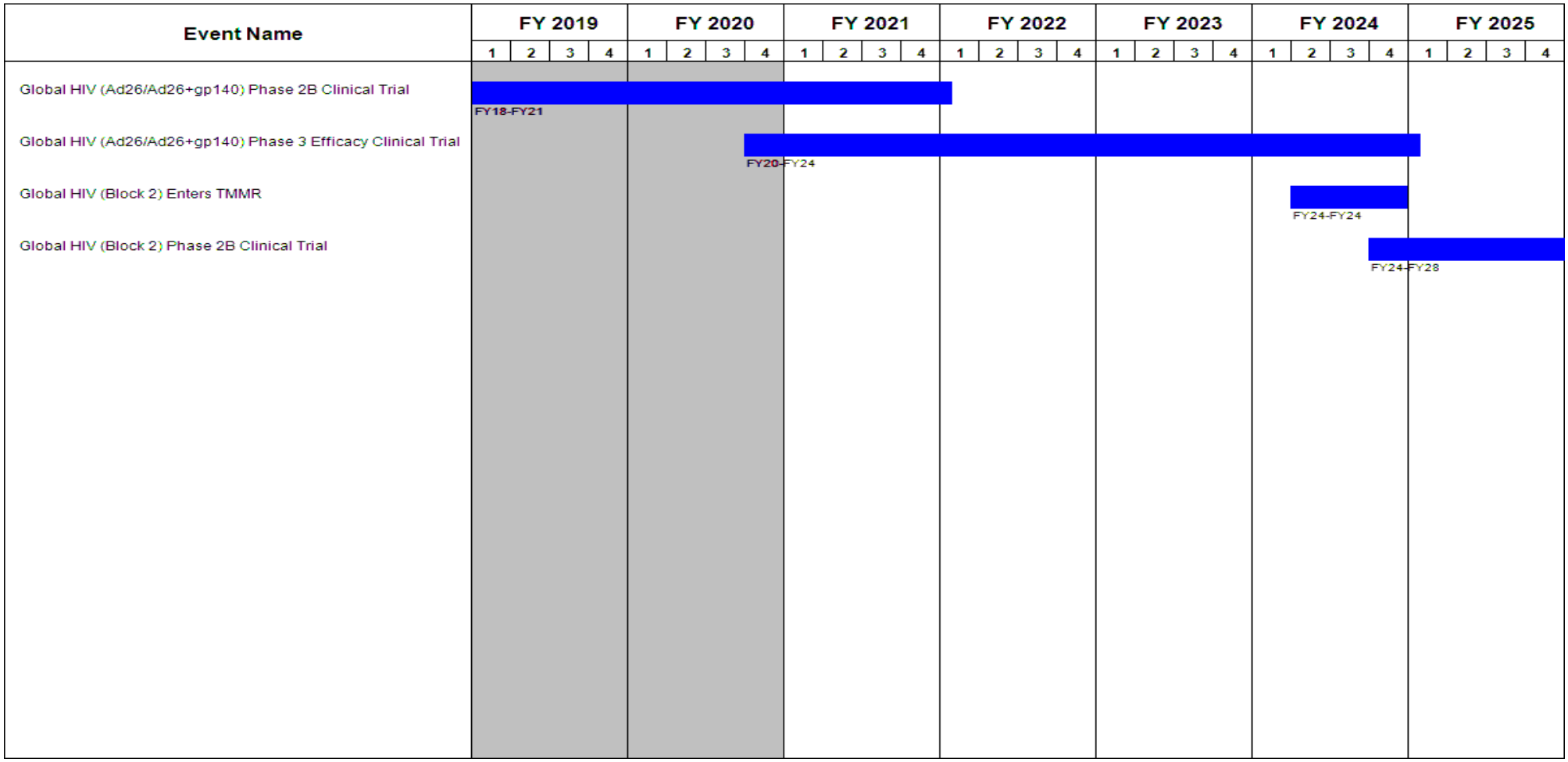

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 811 / *Mil HIV Vac&Drug Dev*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Global HIV (Ad26/Ad26+gp140) Enters TMMR	2	2017	3	2017
Global HIV (Ad26/Ad26+gp140) Phase 2B Clinical Trial	1	2019	1	2022
Global HIV (Ad26/Ad26+gp140) Phase 3 Efficacy Clinical Trial	4	2020	1	2025
Global HIV (Block 2) Enters TMMR	2	2024	4	2024
Global HIV (Block 2) Phase 2B Clinical Trial	4	2024	4	2028

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 836 / *Field Medical Systems Advanced Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
836: *Field Medical Systems Advanced Development*	-	15.676	14.107	12.226	-	12.226	20.435	17.006	17.035	17.419	0.000	113.904
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project funds the demonstration and validation of medical products for enhanced combat casualty care and follow-on care, including rehabilitation. This Project funds human clinical trials to test the safety and effectiveness of biologics (products derived from living organisms) and devices necessary to meet medical requirements. When available, commercial-off-the-shelf (COTS) medical products are also tested and evaluated for transition to engineering and manufacturing development. Consideration is also given to reducing the medical logistics footprint through smaller weight, volume, and equipment independence from supporting materials. All clinical trials are conducted in accordance with U.S. FDA regulations. Products from this project will transition to PE 0604807A/Project 832.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Field Medical Systems Advanced Development - Program Management (PM) Warfighter Expeditionary Medicine and Treatment (formerly PM Medical Devices)	6.947	2.838	11.017
Description: Funding is provided for the development of the following medical devices in support of enhanced combat casualty care. ***FY 2020 Plans:*** Temporary Corneal Repair (TCR): Continue down-select activities. Initiate pre-clinical segment of the Temporary Corneal Repair contract along with all of the Phase II SBIR?s supporting the TCR contract will be completed. Extracorporeal Life Support ?Lung/Renal (ECLS ?L/R): Continue clinical trials and device refinement. Conduct MS B review. Post MS B review, down select to most promising device and conduct FDA pre-submission meeting to finalize regulatory strategy. Non-invasive neuro assessment device (NINAD): Will complete FDA clinical trial. If trial is successful, will initiate manufacturing efforts for NINAD device. Field Anesthesia: Product development eliminated due to CSA priorities. ***FY 2021 Plans:*** Temporary Corneal Repair: Will conduct initial clinical trials in humans to assess safety. Extracorporeal Life Support - Lung/Renal: Continue pre-clinical and/or clinical studies for the lung and renal components required by the Food and Drug Administration. Non-invasive neuro assessment device (NINAD): Moved to WBH due to PMO Reorganization.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 836 / *Field Medical Systems Advanced Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Extremity Injury Repair ? Vascular: Will continue ongoing clinical trials for military relevant applications. Will continue ongoing manufacturing contract. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding FY21 is due to reorganization of PMOs.			
Title: Field Medical Systems Advanced Development - PM Warfighter Protection and Acute Care (formerly PM Pharmaceutical Systems) ***Description:*** Funding is provided for development of blood products enhanced combat casualty care and follow-on care. ***FY 2020 Plans:*** Cold Stored Platelets in Platelet Additive Solution: Will begin Phase II clinical trial based on FDA guidance as to patient population (type of injury/surgical procedure) and numbers to assess safety, effectiveness and dose of candidate product. FY 2020 is a planned progression of medical products under development. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decrease in FY 2021 is due to product not requiring funding in FY 2021.	-	4.498	-
Title: Field Medical Systems Advanced Development - PM Warfighter Health, Performance and Evacuation (formerly PM Medical Support Systems) ***Description:*** Funding is provided for the following effort in the development of products that support the medical mission in combat casualty care and health care operations. ***FY 2020 Plans:*** Nett Warrior Enhanced Physiological Sensors (Wearable): Will continue to collaborate with Program Executive Office Soldier on the development of wearable sensors. Will develop a concussion dosimeter which is part of the Integrated Soldier Sensor System. Semi-autonomous casualty evacuation (CASEVAC) Ground Platform (S-MET): Will be adapting a medical evacuation package to a standardized Army Platform for the transport of a single casualty. Will transition to PE 0604807A Project 832. Transport Telemedicine Systems (TTS) (Formerly named Operational Virtual Health): The Transport Telemedicine system develops MEDHUB (Medical Hands-free Ultra Wideband Broadcast), which will automatically capture, store, and forward medical data to provide lifesaving situational awareness of patient vitals en-route to the Medical Treatment Facility (MTF). Complete	5.559	4.461	1.209

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
prototype design and operational test for the MEDHUB platform. MEDHUB supports Medical Treatment Facilities (MTF) situational awareness. Continue development of MEDHUB Drug Safety and Tracking peripheral. ***FY 2021 Plans:*** Nett Warrior Enhanced Physiological Sensors (Wearable): Consolidated with, and funded under, Concussion Dosimetry for mTBI Assessment below. Concussion Dosimetry for mTBI Assessment: Prepare sensor and algorithms for validation, verification and operational evaluation or transition to PE 654807 (0604807A)/832. Transport Telemedicine Systems (TTS) (Formerly named Operational Virtual Health): Initiate and complete MEDHUB Increment 1 airworthiness, cyber security and other certifications. Continue development of MEDHUB Increment 2 Drug Safety and Tracking system. Next Generation Uniform Repellent/Impregnation: Project was completed and transitioned to PEO Soldier in FY 2020. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decrease in FY 2021 is due to reorganization of PMOs.			
Title: Field Medical Systems Advanced Development - PM Tissue Injury and Regenerative Medicine	-	1.736	-
Description: Funding for engineering and manufacturing development of tissue injury and regenerative medicine health products for enhanced medical capability and readiness ***FY 2020 Plans:*** Field Expedient Large Defect Bone Repair: Will initiate manufacturing of material and pilot efficacy study for repair of damaged or injured bones. Topical Burn Conversion Prevention Product: Continue to prepare for safety and effectiveness trials. Product development efforts will be combined with Systemic Burn Conversion Prevention Product. Systemic Burn Conversion Prevention Product: Continue to prepare for Phase 2 clinical trial. Permanent Acellular Arterial Graft: Depending on FDA guidance at completion of Phase 2, will initiate pivotal study and/or develop trauma registry (database that patients are enrolled in and followed up outside of a randomized clinical trial. ***FY 2020 to FY 2021 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 836 / *Field Medical Systems Advanced Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding decrease in FY 2021 due to reorganization of PMOs			
Title: Field Medical Systems Advanced Developmnet - PM Warfighter Brain Health	3.170	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.574	-
Accomplishments/Planned Programs Subtotals	15.676	14.107	12.226

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Develop in-house or industrial prototypes in government-managed programs to meet military and regulatory requirements for production and fielding.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 836 / *Field Medical Systems Advanced Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Management Services Cost	Various	Not Applicable : Not applicable	45.944	1.785		0.924		0.638		-		0.638	Continuing	Continuing	Continuing
Medical Product Development Management Services Cost	C/IDIQ	Not applicable : Not applicable	1.200	1.095		-		-		-		-	0.000	2.295	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.574		-		-		-	0.000	0.574	-
		Subtotal	47.144	2.880		1.498		0.638		-		0.638	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	TBD	TBD : TBD	0.932	-		-		-		-		-	0.000	0.932	-
Medical Product Development	TBD	ALL Product : Various	3.909	2.811		-		-		-		-	Continuing	Continuing	Continuing
Product Development of Freeze-dried plasma	TBD	TBD : TBD	8.778	-		-		-		-		-	0.000	8.778	-
Point of Care Coagulation Profiler	TBD	TBD : TBD	0.385	-		-		-		-		-	0.000	0.385	-
TBI Diagnostic Assay System - Increment II (benchtop/POC/ Bandits)	TBD	Banyan BioMarkers, Inc : Alachua FL	15.814	-		-		-		-		-	0.000	15.814	-
Impedance Threshold Device for the Treatment of Traumatic Brain Injury	TBD	Advance Circulatory Systems Inc. : Roseville, MN	3.048	-		-		-		-		-	0.000	3.048	-
Compartment Syndrome Pressure Device	TBD	Twinstar : Minniapolis, MN	1.871	-		-		-		-		-	0.000	1.871	-
Hydration Status Monitor	TBD	Gaia Medical : LaJolla CA	0.841	-		-		-		-		-	0.000	0.841	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 836 / *Field Medical Systems Advanced Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Noninvasive Neuromodulator TBI	TBD	TBD : TBD	4.277	-		-		-		-		-	0.000	4.277	-
PTSD	Various	TBD : Various locations	4.275	-		-		-		-		-	0.000	4.275	-
Temporary Corneal Repair	C/Various	Ashvattha Therapeutics, LLC , University of Southern California, Institute of Surgical Research : Redwood City, CA, Los Angeles, CA, San Antonio, TX	5.040	1.795		2.293		4.548		-		4.548	0.000	13.676	-
Extracorporeal Life Support (ECLS) (Formerly ECMO)	Various	Medical Technology Enterprise Consortion : Summerville SC	-	-		-		3.201		-		3.201	0.000	3.201	-
Field Sterilizer	TBD	TBD : TBD	3.515	3.021		-		-		-		-	0.000	6.536	-
Product Development	TBD	HemCon Medical Technologies : Tigard, Oregon	9.720	-		-		-		-		-	10.342	20.062	-
Product Development	TBD	Banyan BioMarkers, Inc : Alachua FL	31.514	-		-		-		-		-	Continuing	Continuing	Continuing
Non-invasive neuro assessment device (NINAD)	C/Various	TBD : TBD	0.800	-		-		-		-		-	0.000	0.800	-
Cold Stored Platelets in Platelet Additive Solution (CSP-PAS) (Formerly Advanced Refrigerated Platel	C/Various	TBD : TBD	-	-		4.570		-		-		-	0.000	4.570	-
Transport Telemedicine Systems (TTS) - MEDHUB	TBD	TBD : TBD	-	0.350		1.928		-		-		-	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platform (Formerly named Operational Virtual Health)															
Extremity Injury Repair (formerly Permanent Acellular Graft)	TBD	SS/CPFF : HumaCyte: Morrisville, NC	-	1.778		0.931		2.695		-		2.695	Continuing	Continuing	Continuing
Nett Warrior Enhanced Physiological Sensors (Wearable)	TBD	Various : Various	-	-		1.081		-		-		-	Continuing	Continuing	Continuing
		Subtotal	94.719	9.755		10.803		10.444		-		10.444	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Support Cost	Various	Not Applicable : Not applicable	47.012	2.429		1.128		1.144		-		1.144	Continuing	Continuing	Continuing
		Subtotal	47.012	2.429		1.128		1.144		-		1.144	Continuing	Continuing	N/A

Remarks

No product/contract costs greater than $1M individually.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development T&E Cost	TBD	Not applicable : Not applicable	38.664	0.612		0.678		-		-		-	Continuing	Continuing	Continuing
		Subtotal	38.664	0.612		0.678		-		-		-	Continuing	Continuing	N/A

Remarks

No product/contract costs greater than $1M individually.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) 836 / *Field Medical Systems Advanced Development*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	227.539	15.676		14.107		12.226		-		12.226	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 836 / *Field Medical Systems Advanced Development*

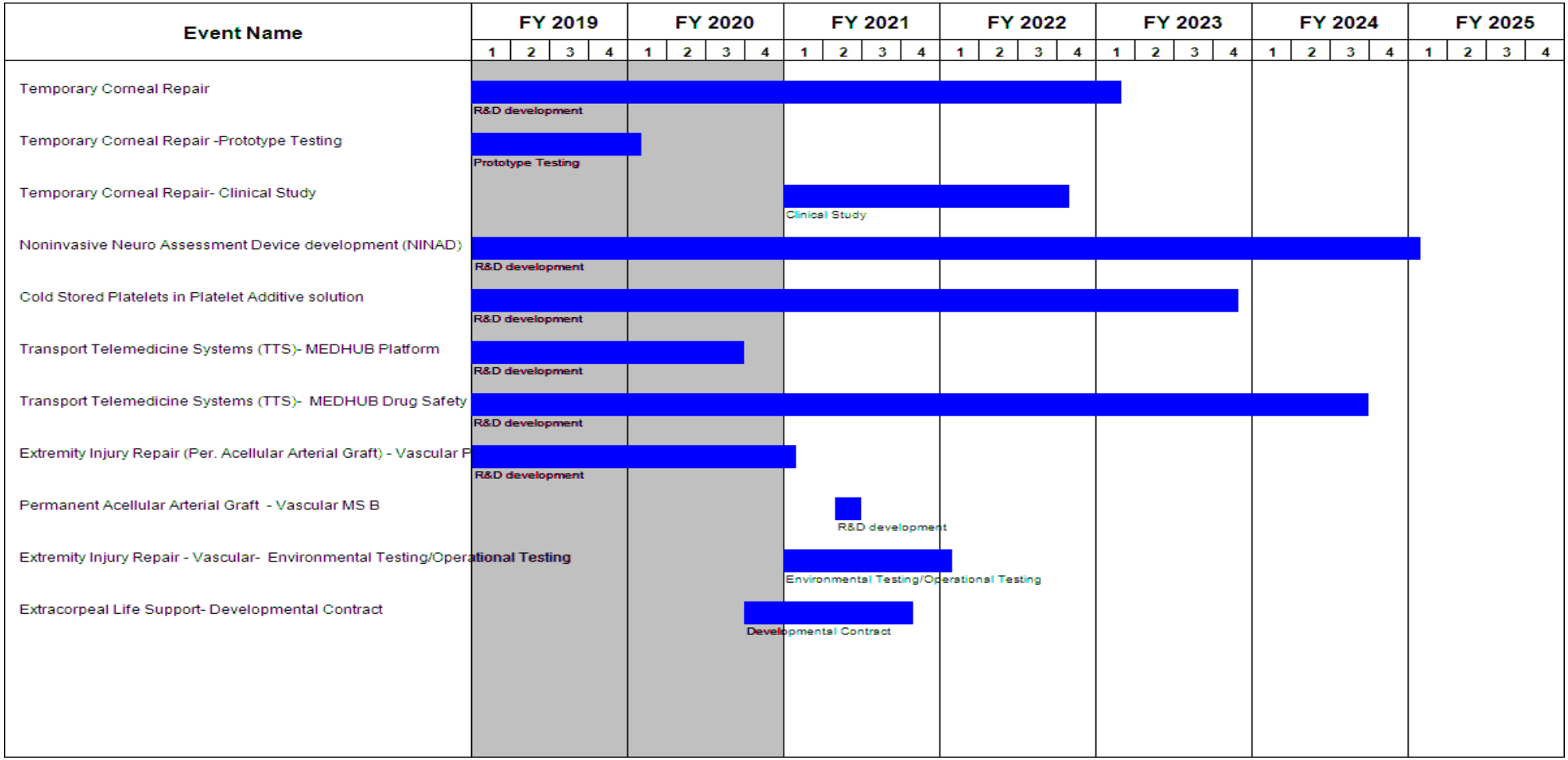


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** 836 / *Field Medical Systems Advanced Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Temporary Corneal Repair	2	2016	1	2023
Temporary Corneal Repair -Prototype Testing	2	2018	1	2020
Temporary Corneal Repair- Clinical Study	1	2021	4	2022
Noninvasive Neuro Assessment Device development (NINAD)	1	2018	1	2025
Cold Stored Platelets in Platelet Additive solution	4	2017	4	2023
Transport Telemedicine Systems (TTS)- MEDHUB Platform	3	2013	3	2020
Transport Telemedicine Systems (TTS)- MEDHUB Drug Safety and Tracking	4	2017	3	2024
Extremity Injury Repair (Per. Acellular Arterial Graft) - Vascular Pivotal Study	1	2019	1	2021
Permanent Acellular Arterial Graft - Vascular MS B	2	2021	2	2021
Extremity Injury Repair - Vascular- Environmental Testing/Operational Testing	1	2021	1	2022
Extracorpeal Life Support- Developmental Contract	4	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) CS4 / *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
CS4: *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*	-	5.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for medical systems advanced development initiatives in Transport Telemedicine - Initiate Joint Advanced Technology Demonstration for MEDHUB to provide Medical Treatment Facility (MTF) automatic situational awareness system to identify patients en-route to MTFs and automate paramedic tasks.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Transport Telemedicine	5.000	-
FY 2019 Accomplishments: Transport Telemedicine		
Congressional Adds Subtotals	5.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** CS4 / *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Telemedicine product development	C/TBD	TBD/ : TBD	7.500	5.000		-		-		-		-	0.000	12.500	-
		Subtotal	7.500	5.000		-		-		-		-	0.000	12.500	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	7.500	5.000		0.000		-		-		-	0.000	12.500	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** CS4 / *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*

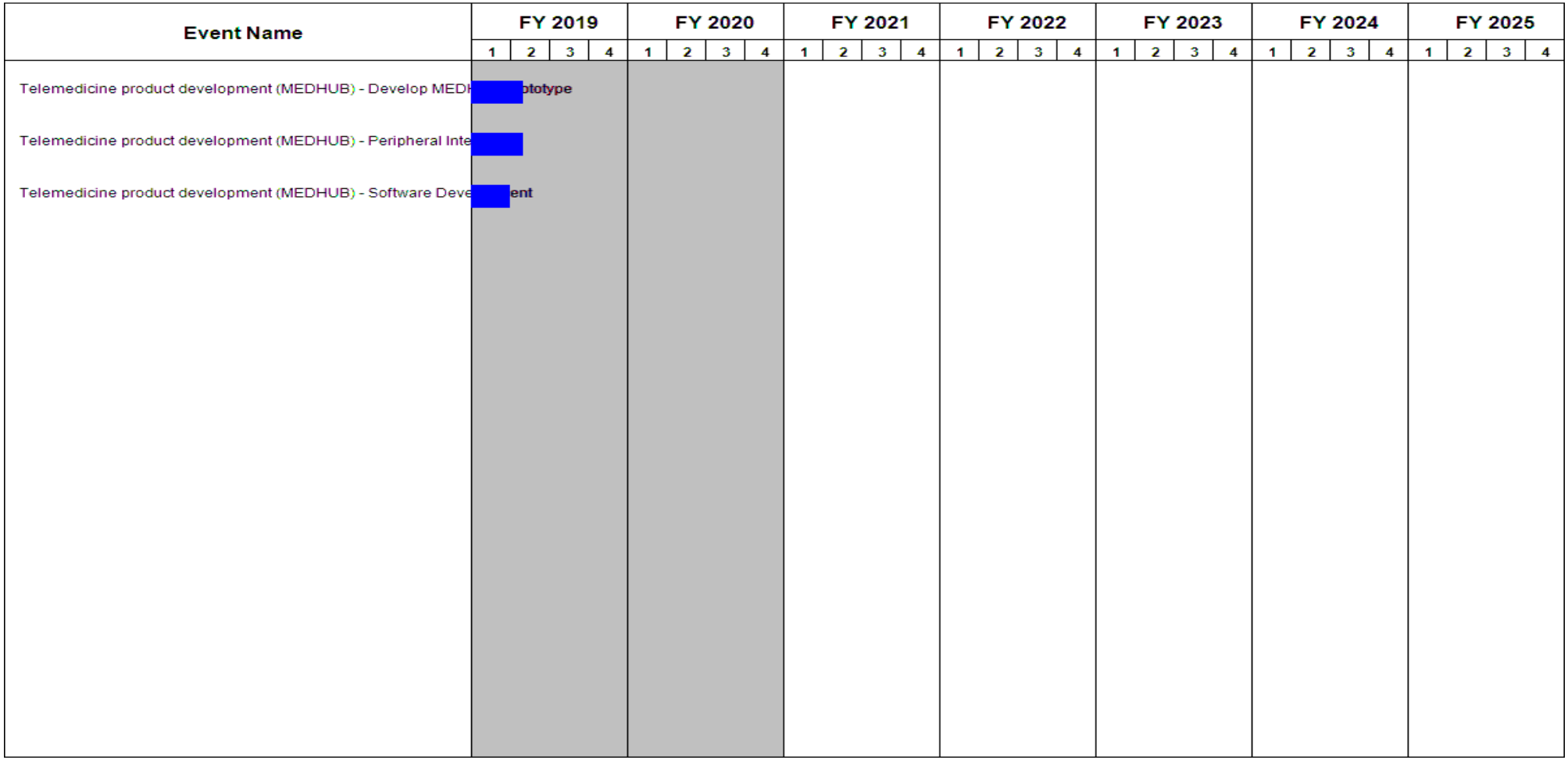


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** CS4 / *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Telemedicine product development (MEDHUB) - Develop MEDHUB Prototype	2	2018	1	2019
Telemedicine product development (MEDHUB) - Peripheral Integration	1	2018	1	2019
Telemedicine product development (MEDHUB) - Software Development	1	2018	1	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) FF4 / *Counterdrug, DDR, Sys Development & Demonstration*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FF4: *Counterdrug, DDR, Sys Development & Demonstration*	-	2.296	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.296
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Supports the Secretary of Defense approved counterdrug advanced development efforts used in a major re-design of the Forensic Toxicology Drug Testing Laboratory (FTDTL) information management system used to test urine samples for the presence of illegal drugs. The Drug Testing Program - Client Collection System (DTP-CSS) is comprised of several variations of a desktop application used to select service members for random drug testing, prepare labels for urine specimen bottles, and print corresponding chain-of-custody documents. This Project will standardize DTP-CSS across all services and migrate it to a Web-based system.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Counterdrug, DDR, Sys Development & Demonstration	2.296	-	-
Accomplishments/Planned Programs Subtotals	2.296	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) FF4 / *Counterdrug, DDR, Sys Development & Demonstration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/UCA	Alliant Corps LLC : San Antonio, TX	12.400	2.296		-		-		-		-	0.000	14.696	-
		Subtotal	12.400	2.296		-		-		-		-	0.000	14.696	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.400	2.296		0.000		-		-		-	0.000	14.696	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** FF4 / *Counterdrug, DDR, Sys Development & Demonstration*

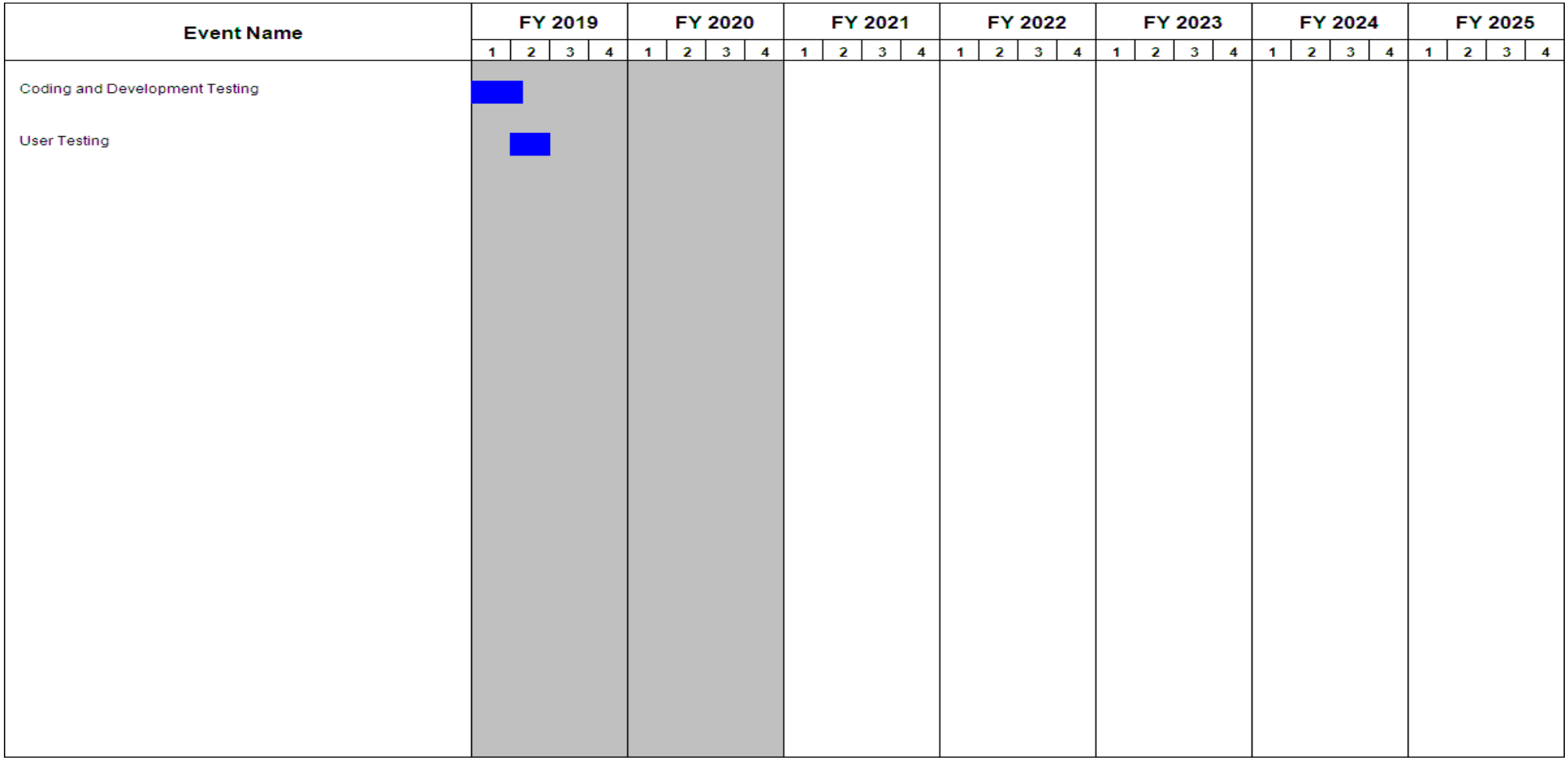


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** FF4 / *Counterdrug, DDR, Sys Development & Demonstration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Determine Hosting requirements	2	2017	2	2017
Coding and Development Testing	3	2017	1	2019
User Testing	1	2019	2	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VS7: *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*	-	0.293	6.093	0.302	-	0.302	0.311	0.000	0.000	0.000	0.000	6.999
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project is funded to achieve the required operational capability and common capability across the MEDEVAC fleet. The MEDEVAC MEP program modernizes and retrofits MEDEVAC legacy helicopters to achieve the medical capability provided by a limited number of mission specific MEDEVAC helicopters, to include Blackhawk and Future Vertical Lift. The Medevac Mission Equipment on the Army MEDEVAC helicopters is critical to maintaining high US troop survival rates during current and future conflicts by evacuating wounded troops quickly while providing good care enroute. To better meet operational needs, in 2009 the Vice Chief of Staff of the Army (VCSA) approved the force design update increasing the number of air frames for MEDEVAC companies. In 2010, the Army Medical Department (US Army) accepted life-cycle management of the MEDEVAC MEP from PEO Aviation. Ongoing research and design efforts are required to prepare and optimize the MEDEVAC fleet with mission equipment. All products from this Project will transition to PE 0604807A/Project VS8.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Medical Evacuation Development	0.293	0.279	0.302
Description: This effort involves Aeromedical Evacuation Cabin and Technology Research to determine the optimum space and configuration for performing necessary life-saving paramedic-level tasks. Efforts will develop patient handling system components and prototypes to ensure paramedic skills and tasks are performed to standard to save Soldiers? lives during point of injury MEDEVAC Missions.			
FY 2020 Plans: Future Vertical Lift (FVL) and UH60 Aeromedical Evacuation Cabin Space and Technology Research and Patient Handling System Design (Medical Evacuation Advanced Development): Continue to develop and design optimum helicopter cabin space configuration and illumination so medics can effectively treat patients during MEDEVAC Missions. Continue to develop patient handling system components and prototypes to ensure paramedics have the ability to perform life-saving tasks in both current and future evacuation platforms. Initiate planning for modernization of the UH60 helicopter medical interior system by reducing weight and designing modularity allowing greater mission flexibility.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Future Vertical Lift (FVL) Aeromedical Evacuation Patient Handling System Design: Continue to develop and design patient handling system for Future Vertical Lift so medics can effectively treat patients during MEDEVAC Missions. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in FY 2021 due to projected requirements of the program.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.014	-
Accomplishments/Planned Programs Subtotals	0.293	0.293	0.302

	FY 2019	FY 2020
Congressional Add: Transport Telemedicine ***FY 2020 Plans:*** Transport Telemedicine	-	5.800
Congressional Adds Subtotals	-	5.800

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Develop in-house or industrial prototypes in government-managed programs to meet military MEDEVAC and regulatory requirements for production and fielding.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Services Cost	Various	APM MEDEVAC PEO Aviation : Huntsville, AL	0.318	0.293		3.054		0.302		-		0.302	0.000	3.967	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.014		-		-		-	0.000	0.014	-
		Subtotal	0.318	0.293		3.068		0.302		-		0.302	0.000	3.981	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Cost	TBD	APM MEDEVAC PEO Aviation : Huntsville AL	1.624	-		3.025		-		-		-	0.000	4.649	-
		Subtotal	1.624	-		3.025		-		-		-	0.000	4.649	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Support Cost	TBD	APM MEDEVAC PEO Aviation : Huntsville, AL	0.911	-		-		-		-		-	0.000	0.911	-
		Subtotal	0.911	-		-		-		-		-	0.000	0.911	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / *Medical Systems - Adv Dev*	Project (Number/Name) VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development T&E Cost	MIPR	APM MEDEVAC PEO Aviation : Huntsville, AL	0.199	-		-		-		-		-	0.000	0.199	-
		Subtotal	0.199	-		-		-		-		-	0.000	0.199	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.052	0.293		6.093		0.302		-		0.302	0.000	9.740	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*

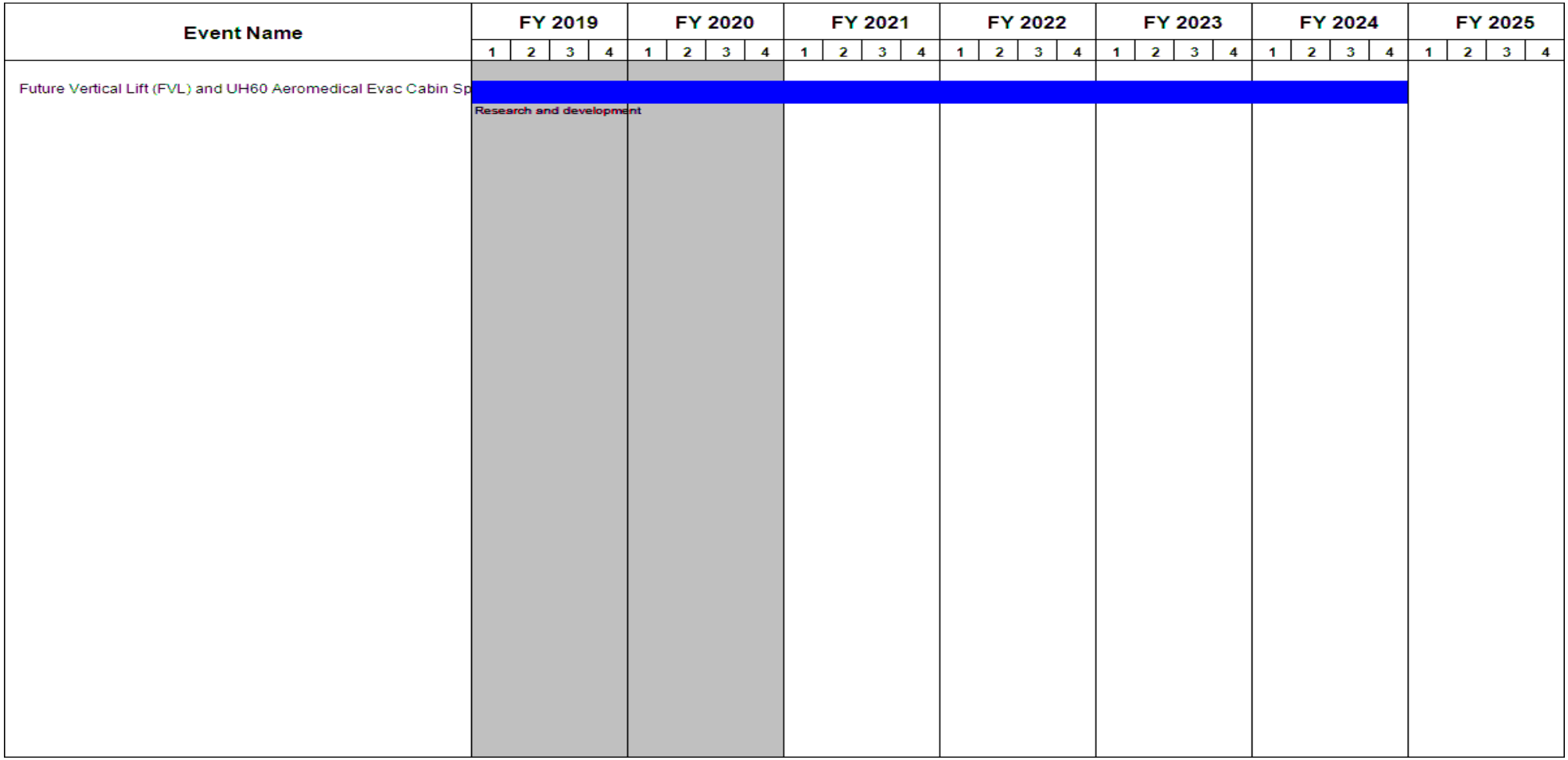


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603807A / *Medical Systems - Adv Dev*	**Project (Number/Name)** VS7 / *MEDEVAC Mission Equipment Package (MEP) - Adv Dev*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Future Vertical Lift (FVL) and UH60 Aeromedical Evac Cabin Space and Technology	1	2017	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	30.384	26.113	26.138	-	26.138	30.945	33.961	28.535	32.332	Continuing	Continuing
CF2: *Integrated Soldier Systems Prototyping (SL CFT)*	-	0.000	1.959	2.541	-	2.541	3.149	3.771	3.843	3.881	0.000	19.144
ET8: *Personnel Airdrop System Development*	-	0.396	0.297	1.266	-	1.266	1.264	1.811	0.999	0.999	Continuing	Continuing
S53: *Clothing And Equipment*	-	1.765	6.466	1.808	-	1.808	2.414	4.474	5.073	8.726	Continuing	Continuing
S54: *Small Arms Improvement*	-	7.395	14.555	16.082	-	16.082	19.213	17.423	10.477	10.583	0.000	95.728
VS4: *Soldier Protective Equipment*	-	20.828	2.836	4.441	-	4.441	4.905	6.482	8.143	8.143	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE), Advanced Component Development and Prototypes, manages the Soldier as a system to increase combat effectiveness, test and deliver tangible products that save Soldiers lives and improve combat capability. The PE provides funding for evaluating, developing, and testing emerging technologies and critical Soldier support systems to reduce technology risk.

CF2
The Integrated Squad effort includes the completion of the Adaptive Squad Architecture (ASA) and Squad Performance Model (SPM) programs. Both of these efforts are Program Executive Office-Soldier (PEO-S) led and will develop a full system architecture for the Soldier and the Squad. This will be accomplished by developing Interface Control Documents (ICDs) in order to provide common established interfaces for internal and external stakeholders who will interface on or with the Soldier platform. A critical part of this effort is development of the "Squad as an Integrated Platform" vision based on threat, operational environment and collaboration with internal and external stakeholders to inform investment decisions out to FY 2050. The ASA will develop a metric-based approach that will include live, virtual and constructive evaluations and tools across the Department of Defense (DoD), academia and industry which will be used for senior leaders to make deliberate decisions based on the analysis of Soldier/ Squad performance

ET8
Personnel Airdrop System supports efforts to improve Low Altitude and High Altitude personnel parachutes and associated equipment to include canopy improvement based on integration of new technology with the goal of enhancing the insertion capability and safety of the airborne Soldier and increasing the performance, reliability, and durability of personnel airdrop equipment.

S53
This Project supports efforts to evaluate and integrate technologies and representative or prototype systems that help expedite Soldier Clothing and Individual Equipment technology transition from the laboratory to operational use. Efforts focus on proving out commonality across as broad a spectrum of users as possible to

provide a modular, integrated uniform/clothing system from skin out and head-to-toe. It funds efforts to transition new technologies and domestically available fabrics with Flame Resistant (FR), moisture wicking, insect protection and camouflage technologies, including integration of fabrics appropriate for uniforms and equipment used in jungle/tropical and arctic environments. New technologies are indentified to monitor health and improve Soldier survivability, reduce weight, and improve affordability, mobility and comfort in combat and training/administrative environments. Includes integration and interface on the Soldier system.

S54
The Small Arms Improvement Advanced Component Development and Prototypes (ACD&P) program provides funds to mature, demonstrate, test and evaluate emerging technology from Budget Activity (BA) 3 Program Element 0603607A Joint Service Small Arms Program (JSSAP) Project 627 Defense Advanced Research Projects Agency (DARPA), Department of Energy National Laboratories, Research Development & Engineering Centers (RDECs) and other domestic and foreign sources for small arms weapon systems and technology. Small arm weapon systems include weapons ranging up to 40 millimeter in caliber. Current and future efforts focus on improvements designed to enhance lethality, target acquisition and tracking, fire control, usability, training effectiveness and reliability of weapons to include ammunition when developing and/or evaluating standard and non-standard weapons. Focus areas include the maturing of technology through testing and evaluation of sub-system or system prototypes which demonstrates light weight materials, wear resistant/protective/anti-reflective coatings, observation/situational awareness improvements, human-systems integration, robotic armament capability, non-lethal capability, and equipment enhancements. Benefits include continuous improvements to small arms weapon systems, fire control equipment, optics, gun barrels, training devices, suppressors, component mounts, weapon mounts, and weapon/ammunition interface. Includes costs associated with efforts for integration and interface of products on Soldiers' head, body and weapons.

VS4
This Project supports efforts to evaluate integrated technologies and representative or prototype systems that help expedite Personal Protective Equipment (PPE) technology transition from the laboratory to operational use.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	31.022	22.113	26.161	-	26.161
Current President's Budget	30.384	26.113	26.138	-	26.138
Total Adjustments	-0.638	4.000	-0.023	-	-0.023
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	4.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.638	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.023	-	-0.023

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603827A *I Soldier Systems - Advanced Development*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: S53: *Clothing And Equipment*		
Congressional Add: *Cold Weather Clothing*	-	4.000
Congressional Add Subtotals for Project: S53	-	4.000
Congressional Add Totals for all Projects	-	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) CF2 / *Integrated Soldier Systems Prototyping (SL CFT)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
CF2: *Integrated Soldier Systems Prototyping (SL CFT)*	-	0.000	1.959	2.541	-	2.541	3.149	3.771	3.843	3.881	0.000	19.144
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Verify and maintain tools that provide Systems Engineering, Configuration Management, and Evaluations in a virtual and physical environment. Verify and maintain the Adaptive Squad Architecture (ASA) and Squad Performance Model (SPM) with emphasis on development of ICDs, specifically to support the rapid integration of the Soldier Lethality Cross Functional Team (SL CFT) priority programs with all other equipment the dismounted Soldier will use. Provide prototyping of capabilities for evaluation and integration. Execute evaluation of new measurements and methodologies from the S&T community, execute system level evaluation environments, and support Soldier system modeling. Funding for this project aligns with the Army's priorities in support of the National Defense Strategy and is a priority of the Soldier Lethality Cross Functional Team. FY 2020 RDTE funding in the amount of $1.959M will finalize an initial ASA and SPM, consisting of 3 critical products: the Configuration Database (CD), the Architectural Assessment Tool (AAT) and the SPM.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Integrated Soldier Systems Prototyping	-	1.870	2.541
Description: Verify and maintain tools that provide Systems Engineering, Configuration Management, and Evaluations in a virtual and physical environment. Verify and maintain the ASA and SPM with emphasis on development of ICDs, specifically to support the rapid integration of the Soldier Lethality Cross Functional Team (SL CFT) priority programs with all other equipment the dismounted Soldier will use. Provide prototyping of capabilities for evaluation and integration. Execute evaluation of new measurements and methodologies from the S&T community, execute system level evaluation environments, and support Soldier system modeling. Funding for this project aligns with the Army's priorities in support of the National Defense Strategy and is a priority of the Soldier Lethality Cross Functional Team			
FY 2020 Plans: FY 2020 Plans: Finalize operational version of ASA and SPM			
FY 2021 Plans: Accelerate the development of components, algorithms, and demonstrations in support of Squad as an Integrated Combat Platform			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** CF2 / *Integrated Soldier Systems Prototyping (SL CFT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 to FY 2021 increase in required funding due to increased trade-off analysis of technology integration with Soldiers' personal protection, electronics connectivity, power and energy, user interfaces, and display content.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.089	-
Accomplishments/Planned Programs Subtotals	-	1.959	2.541

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• CF3: *Integrated Soldier Systems (SL CFT)*	-	4.504	4.597	-	4.597	4.425	4.498	4.580	4.626	0.000	27.230

Remarks

D. Acquisition Strategy

Develop and validate the verification and operation of the ASA tools (Configuration Database (CD), Architectural Assessment Tool (AAT), Squad Performance Model (SPM)) under full and open competition. Attempt to utilize one vendor for, at a minimum, maintenance of the CD and AAT. Conduct evaluations to support the SPM, with the Government acting as the lead developer.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) CF2 / *Integrated Soldier Systems Prototyping (SL CFT)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.089		-		-		-	0.000	0.089	-
		Subtotal	-	-		0.089		-		-		-	0.000	0.089	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Adaptive Soldier Architecture (ASA) Squad Performance Model (SPM)	C/FFP	TBD : TBD	-	-		0.455	Jan 2020	0.500	Jan 2021	-		0.500	Continuing	Continuing	Continuing
		Subtotal	-	-		0.455		0.500		-		0.500	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ASA/SPM Test & Eval	C/FFP	TBD : TBD	-	-		1.415		2.041	Dec 2020	-		2.041	Continuing	Continuing	Continuing
		Subtotal	-	-		1.415		2.041		-		2.041	Continuing	Continuing	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		1.959		2.541		-		2.541	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** CF2 / *Integrated Soldier Systems Prototyping (SL CFT)*

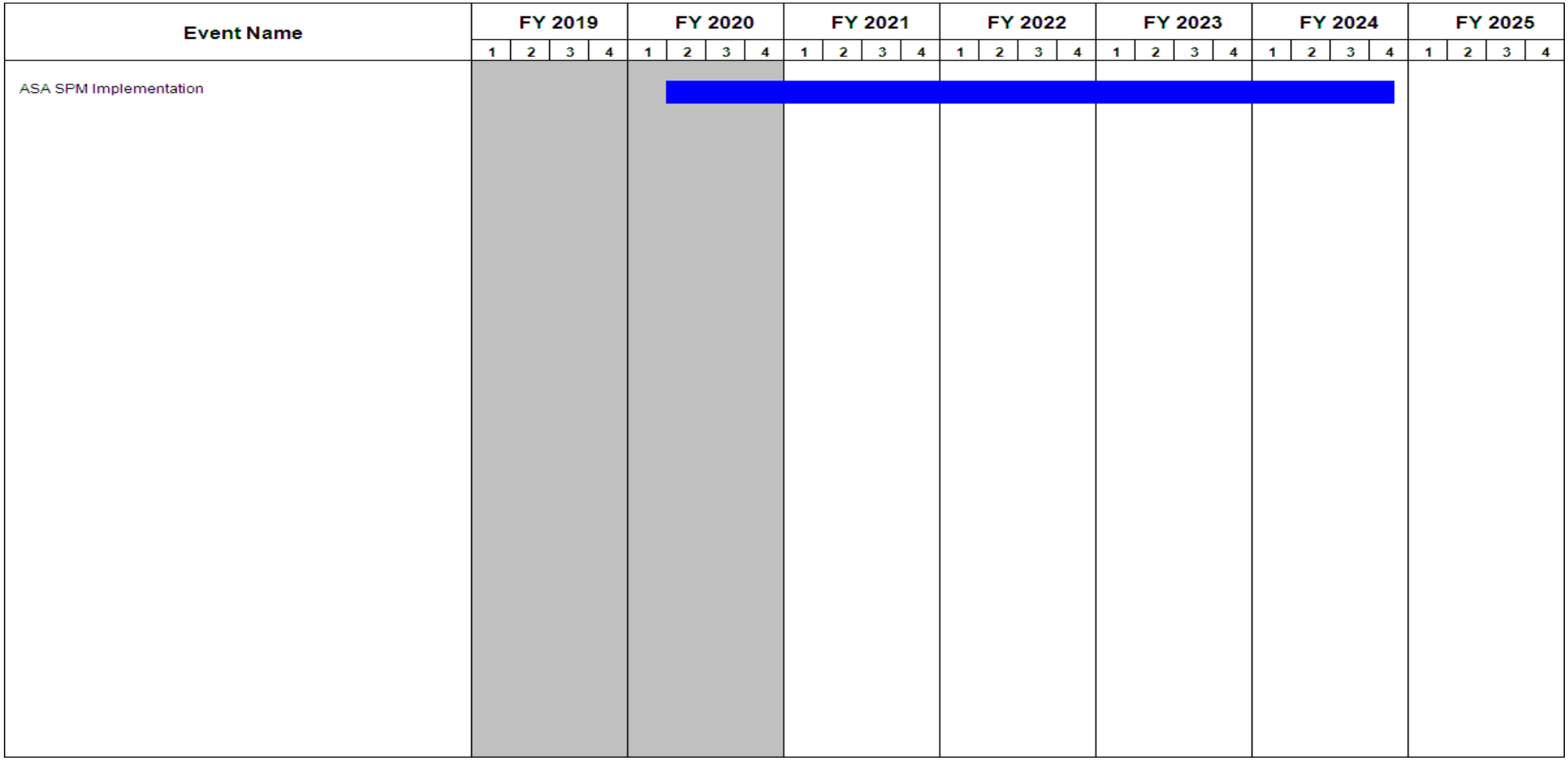


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** CF2 / *Integrated Soldier Systems Prototyping (SL CFT)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
ASA SPM Implementation	2	2020	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) ET8 / *Personnel Airdrop System Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
ET8: *Personnel Airdrop System Development*	-	0.396	0.297	1.266	-	1.266	1.264	1.811	0.999	0.999	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding in this project supports the Army's Cross Functional Teams (CFT) initiatives. Project ET8, Personnel Airdrop System, supports efforts to improve Low Altitude and High Altitude personnel parachutes and associated equipment to include canopy improvement based on integration of new technology with the goal of enhancing the insertion capability and safety of the airborne Soldier and increasing the performance, reliability, and durability of personnel airdrop equipment. This project will transition capabilities from our Science and Technology partners to increase performance and safety of Soldier clothing and equipment. It will continue to support cross-service initiatives to improve commonality.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Personnel Airdrop System Development	0.396	0.283	1.266
Description: Improve Low Altitude and High Altitude personnel parachutes and associated equipment to include canopy improvements based on integration of new technology with the goal of enhancing the insertion and safety of the airborne soldier and increasing the performance, reliability, and durability of personnel airdrop equipment.			
FY 2020 Plans: Evaluate Low Altitude Static Line Automatic Activation Devices as well as Universal Static Line smart snap hook and Jumper Recovery Systems.			
FY 2021 Plans: Continue evaluation of Low Altitude Static Line Automatic Activation Devices (now called T11 RAAD or T11 Reserve Automatic Activation Device (T-11R AAD)) and begin evaluation of Smart Universal Static Line Snap Hook (SUSH).			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding increase in Personnel Airdrop System Development portfolio is due to the continued development of the T-11 Reserve Automatic Activation Device (T-11R AAD) and the initial evaluation of the Smart Universal Static Line Snap Hook (SUSH) technology.			
Title: FY 2020 SBIR/STTR Transfer	-	0.014	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** ET8 / *Personnel Airdrop System Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	0.396	0.297	1.266

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• ES9: *Advanced Tactical Parachute System*	6.457	6.617	1.827	-	1.827	2.962	2.961	2.997	3.996	0.000	27.817
• MA7801: *Advanced Tactical Parachute System*	41.104	42.622	53.021	-	53.021	47.755	39.808	38.978	25.110	0.000	288.398

Remarks

D. Acquisition Strategy

Programs pursue technology maturation and prototype development, culminating in the transition of mature technologies (Technology Readiness Level (TRL) 6-7) to system development and demonstration (SDD).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) ET8 / *Personnel Airdrop System Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.014		-		-		-	0.000	0.014	-
		Subtotal	-	-		0.014		-		-		-	0.000	0.014	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Contracts	C/FFP	TBD : TBD	-	-		0.093		0.727		-		0.727	2.588	3.408	-
Engineering Support	MIPR	CCDC Natick, MA : various	0.460	0.096		0.096		0.100		-		0.100	0.827	1.579	-
		Subtotal	0.460	0.096		0.189		0.827		-		0.827	3.415	4.987	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Allot	PM SCIE : Belvoir	0.245	0.100		0.094		0.100		-		0.100	0.811	1.350	-
		Subtotal	0.245	0.100		0.094		0.100		-		0.100	0.811	1.350	N/A

Test and Evaluation ($ in Millions)

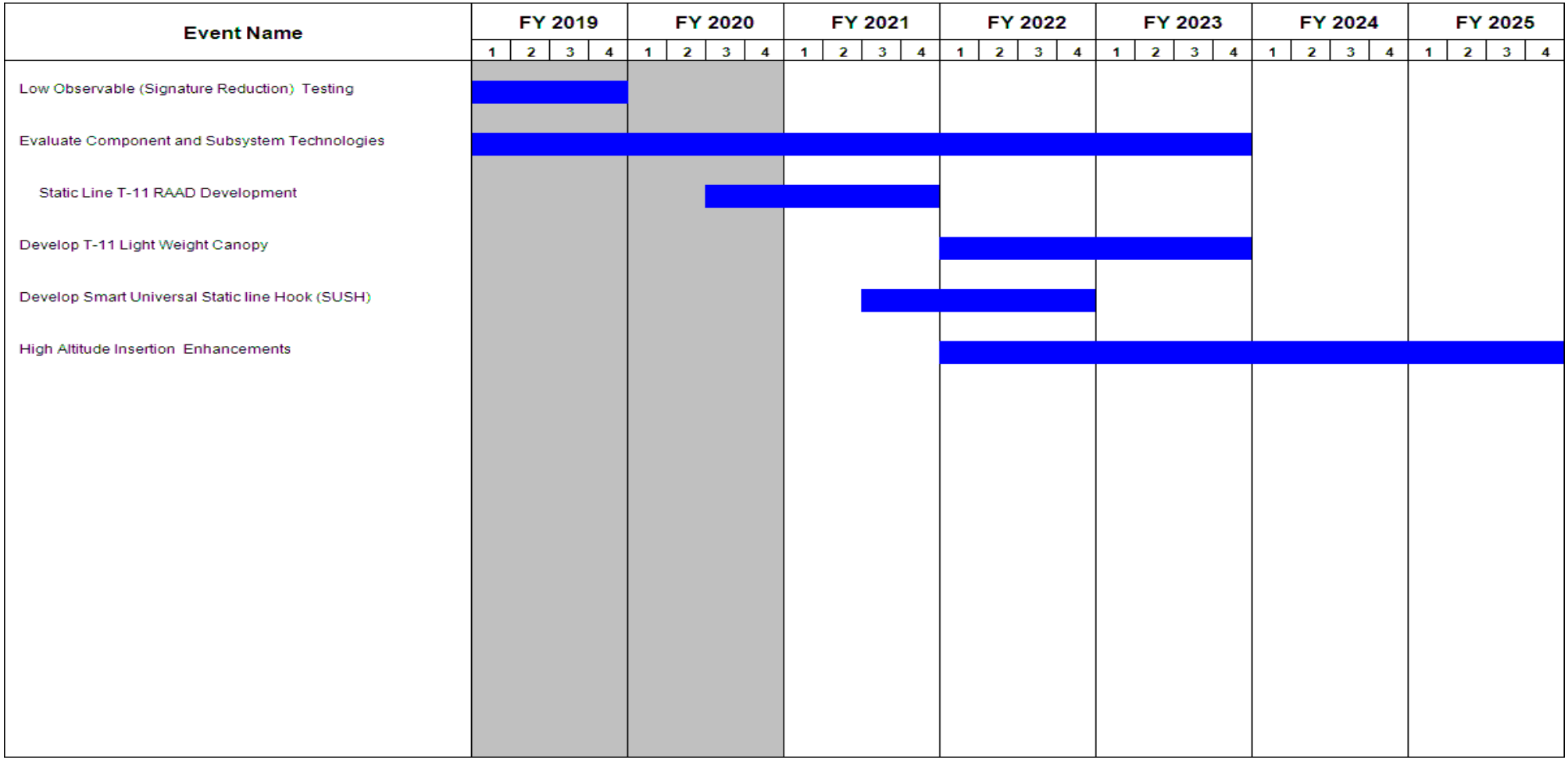
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	MIPR	TBD : TBD	0.435	0.200		-		0.339		-		0.339	0.782	1.756	-
		Subtotal	0.435	0.200		-		0.339		-		0.339	0.782	1.756	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) ET8 / *Personnel Airdrop System Development*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.140	0.396		0.297		1.266		-		1.266	5.008	8.107	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** ET8 / *Personnel Airdrop System Development*



Note

High Altitude Insertion Enhancements includes the following: Glide Augmentation, Situational Awareness Aids, GPS Denied Navigation Aid and High Altitude Combo Drops.

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** ET8 / *Personnel Airdrop System Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Low Observable (Signature Reduction) Testing	1	2019	4	2019
Evaluate Component and Subsystem Technologies	1	2019	4	2023
Static Line T-11 RAAD Development	3	2020	4	2021
Develop T-11 Light Weight Canopy	1	2022	4	2023
Develop Smart Universal Static line Hook (SUSH)	3	2021	4	2022
High Altitude Insertion Enhancements	1	2022	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S53 / *Clothing And Equipment*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
S53: *Clothing And Equipment*	-	1.765	6.466	1.808	-	1.808	2.414	4.474	5.073	8.726	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding in this project supports the Army's Cross Functional Teams (CFT) initiatives. This Project supports efforts to evaluate and integrate technologies and representative or prototype systems that help expedite Soldier Clothing and Individual Equipment technology transition from the laboratory to operational use. Efforts focus on proving out commonality across a broad spectrum of users to provide a modular, integrated uniform/clothing system from skin out and head-to-toe. It funds efforts to transition new technologies and domestically available fabrics with Flame Resistant (FR), moisture wicking, insect protection and camouflage technologies, including integration of fabrics appropriate for uniforms and equipment used in all environments such as jungle/tropical and arctic environments. New technologies are indentified to monitor health and improve Soldier survivability, reduce weight, and improve affordability, mobility and comfort in combat and training/administrative environments. Includes integration and interface on the Soldier system. This project will transition capabilities from our Science and Technology partners to increase performance and safety of Soldier clothing and equipment. It will continue to support cross-service initiatives to increase commonality.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Soldier Uniforms and Clothing	1.765	0.472	1.419
Description: Develop superior and sustainable integrated clothing for the Soldier in a rapidly changing global environment.			
FY 2020 Plans: Continue Flame Resistant clothing upgrades. Continue Signature Management evaluation in Camouflage equipment. Continue to evaluate improved lighter weight textiles which incorporate improved vector protection, FR protection, and environmental protection while providing comfort, utility, and functionality. Also, continue to evaluate materials to support extreme cold temperature protection for military free fall parachutists. The S&T transition for environmental cold/wet protection clothing system is planned.			
FY 2021 Plans: Continue Flame Resistant clothing upgrades. Analyze Flame Resistant garment upgrades and review/improve testing protocols. Continue Signature Management efforts in Camouflage Flame Resistant clothing and equipment. Develop enhanced OCIE capabilities for Soldiers operating in cold and extreme cold environments. Continue testing novel materials and processes to improve clothing and equipment for extreme climates. Improve size standardization for all individually sized items.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S53 / *Clothing And Equipment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY20 $4M Congressional Add for Cold Weather Clothing. Funding increase between FY 2020 and FY 2021 due to anticipated requirements changes.			
Title: Individual Equipment	-	1.994	0.389
Description: Develop and provide superior and sustainable integrated individual equipment for the Soldier in a rapidly changing global environment. ***FY 2020 Plans:*** Develop process and procedures for the Dyeing of Aramid Blends, used in environmental clothing. Develop and evaluate hydration devices items like cold weather canteens, individual water treatment devices, and multi purpose hydration systems. ***FY 2021 Plans:*** Analyze Flame Resistant garment upgrades and review/improve testing protocols. Begin development of a Toxic Industrial Chemicals/Toxic Industrial Materials (TIC/TIM) filtration capability for the Individual Water Treatment Device (IWTD). Evaluate current load carriage equipment to asses its ability to support the modernization of current individual weapons and situational awareness capabilities. Optimize the capability of Load Carriage items to support modernization for weapons and tactical gear. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decrease from FY 2020 to FY 2021 due to anticipated changes in requirements.			
Accomplishments/Planned Programs Subtotals	1.765	2.466	1.808

	FY 2019	FY 2020
Congressional Add: Cold Weather Clothing	-	4.000
FY 2020 Plans: Cold Weather Clothing		
Congressional Adds Subtotals	-	4.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• S60: *Clothing & Equipment*	8.152	6.453	6.717	-	6.717	5.010	4.846	3.697	6.814	0.000	41.689

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S53 / *Clothing And Equipment*

D. Acquisition Strategy

Programs pursue technology maturation and prototype development, culminating in the transition of mature technologies (Technology Readiness Level (TRL) 6-7) to Systems Development and Demonstration. This Project continues to exercise competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S53 / *Clothing And Equipment*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	TBD	PM SPIE : Ft. Belvoir, VA	15.495	0.285		0.296		0.290		-		0.290	Continuing	Continuing	Continuing
		Subtotal	15.495	0.285		0.296		0.290		-		0.290	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	MIPR	NSRDEC : Natick, MA	16.338	0.327		1.441		0.347		-		0.347	Continuing	Continuing	Continuing
Development Contracts	C/FFP	Various : Various	34.449	0.355		2.588		0.374		-		0.374	Continuing	Continuing	Continuing
FY 2019 SBIR /STTR Transfer/FFRDC	TBD	TBD : TBD	-	0.060		-		-		-		-	0.000	0.060	-
		Subtotal	50.787	0.742		4.029		0.721		-		0.721	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program OfficeSupport Costs	MIPR	Natick,MA : Natick, MA	8.402	0.302		0.296		0.322		-		0.322	Continuing	Continuing	Continuing
		Subtotal	8.402	0.302		0.296		0.322		-		0.322	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Testing Costs	MIPR	Various : Various	26.914	0.436		1.845		0.475		-		0.475	Continuing	Continuing	Continuing
		Subtotal	26.914	0.436		1.845		0.475		-		0.475	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S53 / *Clothing And Equipment*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	101.598	1.765		6.466		1.808		-		1.808	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S53 / *Clothing And Equipment*

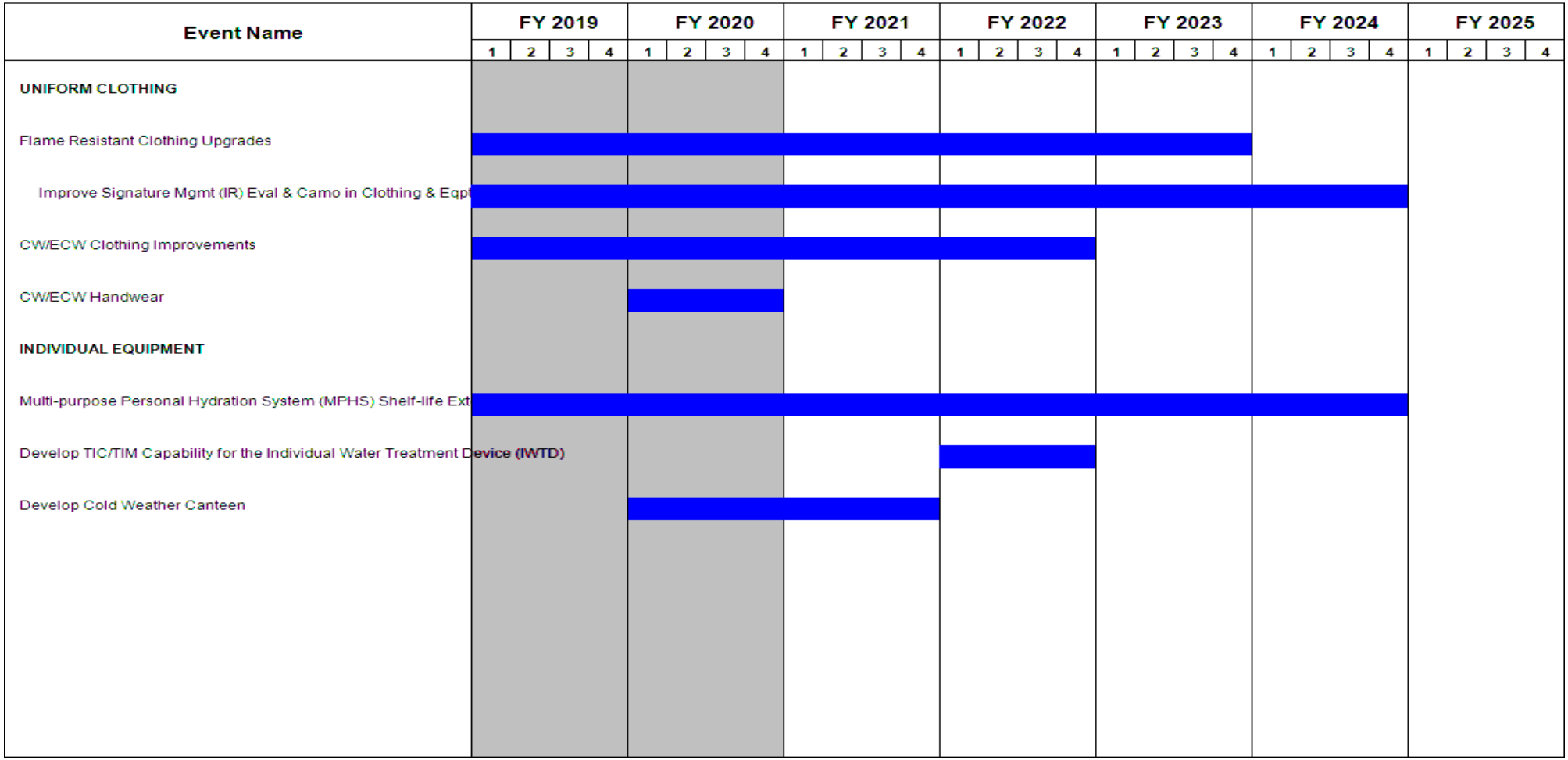


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S53 / *Clothing And Equipment*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
UNIFORM CLOTHING	1	2010	4	2025
Flame Resistant Clothing Upgrades	1	2012	4	2023
Improve Signature Mgmt (IR) Eval & Camo in Clothing & Eqpt	2	2012	4	2024
CW/ECW Clothing Improvements	1	2019	4	2022
CW/ECW Handwear	1	2020	4	2020
INDIVIDUAL EQUIPMENT	4	2015	4	2025
Multi-purpose Personal Hydration System (MPHS) Shelf-life Extension Eval	1	2019	4	2024
Develop TIC/TIM Capability for the Individual Water Treatment Device (IWTD)	1	2022	4	2022
Develop Cold Weather Canteen	1	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S54 / *Small Arms Improvement*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
S54: *Small Arms Improvement*	-	7.395	14.555	16.082	-	16.082	19.213	17.423	10.477	10.583	0.000	95.728
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Small Arms Improvement Advanced Component Development and Prototypes (ACD&P) program provides funds to mature, demonstrate, test and evaluate emerging technology from Budget Activity (BA) 3 Program Element (PE) 0603607A Joint Service Small Arms Program (JSSAP) Project 627 Defense Advanced Research Projects Agency (DARPA), Department of Energy National Laboratories, Research Development & Engineering Centers (RDECs) and other domestic and foreign sources for small arms weapon systems and technology. Small arm weapon systems include weapons ranging up to 40 millimeter in caliber. Current and future efforts focus on improvements designed to enhance lethality, target acquisition and tracking, fire control, usability, training effectiveness and reliability of weapons to include ammunition when developing and/or evaluating standard and non-standard weapons. Focus areas include the maturing of technology through testing and evaluation of sub-system or system prototypes which demonstrates light weight materials, wear resistant/protective/anti-reflective coatings, observation/situational awareness improvements, human-systems integration, robotic armament capability, non-lethal capability, and equipment enhancements. Benefits include continuous improvements to small arms weapon systems, fire control equipment, optics, gun barrels, training devices, suppressors, component mounts, weapon mounts, and weapon/ammunition interface. Includes costs associated with efforts for integration and interface of products on Soldiers' head, body and weapons.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: New Weapon Systems	0.800	2.505	2.590
Description: Development of new small arms weapon systems. ***FY 2020 Plans:*** Externally Powered Weapon (EPW): Continued to support the development of the Capability Development Document (CDD) with Maneuver Center of Excellence and Maneuver Support Center of Excellence. Intended to leverage information gathered from prototype testing and developed a demonstrator to better evaluate and inform the CDD and the various platforms that may include the EPW as their Armament System. Initiated the intelligence/networking and weapons design and functions for a man-in-the-loop, small caliber defensive armaments system on an unmanned ground vehicle including the Warfighter/Robot interface. New Weapon Systems Evaluations and Assessments: Continued to perform initial evaluation and assessment of new weapon systems. ***FY 2021 Plans:*** Next Generation Weapons will begin to support technology development for future Next Generation Weapon variants addressing operational force needs for increased lethality, increased probability of hit, increased solider acceptance, decreased signature,			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
reduced recoil, reduced soldier aim error, and reduced engagement time. New weapons may be variants or enhancements of the NGSW-R and NGSW-AR or new weapon platforms to fulfill other roles such as machine guns, sniper rifles, and others. EPW will complete maturation and upgrade of prototype system based on test and experimentation results. Will continue with integration of intelligence/networking/remote operation capabilities. Will continue to work with Maneuver and Maneuver Support Capabilities Development and Integration Directorate (M-CDID and MS-CDID) Futures and Concepts Centers regarding the Capability Development Document. New Weapons Systems Evaluations and Assessments: Will continue to perform initial and follow-on evaluations, assessments and integration of new weapons to include various new weapon system platforms. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funding required for development and testing of New Weapon Systems.			
Title: Small Arms Weapon Systems Enhancements ***Description:*** Enhancements and development of small arms weapon systems. ***FY 2020 Plans:*** Current and Legacy Weapon Improvements assessed and evaluated selected capabilities and improvements for all current and legacy weapon systems. Solid State Active Denial System worked to complete maturation of design, continued to monitor status of Capability Development Document and provided input into programmatic documents as necessary. Individual Non-Lethal System worked to complete maturation of design and got it ready for prove out test at Government facility in support of Milestone B. Previously funded in Fiscal Year (FY) 2017. Non-Standard Weapons Assessments continued to conduct baseline testing of commercial weapon systems and perform capability analysis of unique weapon characteristics. Continued to utilize test information to conduct trade off assessments of Non-Developmental Item solutions for pending requirements as well as established safety parameters for the training mission of Regionally Aligned Forces and established a sustainment strategy for long term support of weapons procured to support the Regionally Aligned Forces training mission. Continued to conduct market research of commercially available weapon systems.	1.340	7.650	8.645

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Small Business Innovative Research Enhancements continued future efforts to focus on improvements designed to enhance lethality, target acquisition and tracking, fire control, training effectiveness and reliability of weapons.			
FY 2021 Plans: Next Generation Defeat will design, develop, and prototype fabrication of advanced technologies to incorporate into Soldier employable system that will be capable of on-target effects against multiple types of targets (i.e. targets behind cover, targets that are exposed, thin skin vehicles, unmanned aerial systems) Next Generation Weapons/Enhancements will begin to support technology development for future Next Generation Weapon variants addressing operational force needs for increased lethality, increased probability of hit, increased solider acceptance, decreased signature, reduced recoil, reduced soldier aim error, and reduced engagement time. New weapons may be variants or enhancements of the Next Generation Squad Weapon Rifle (NGSW-R) and Next Generation Squad Automatic Rifle (NGSAR) or new weapon platforms to fulfill other roles such as machine guns, sniper rifles, and others. Non-Standard Weapons Assessments will continue to conduct baseline testing of commercial weapon systems and perform capability analysis of unique weapon characteristics. Continue to utilize test information to conduct trade off assessments of Non-Developmental Item solutions for pending requirements as well as establish safety parameters for the training mission of Regionally Aligned Forces and other non Department of Defense (DOD) customers. Will continue to establish a sustainment strategy for long term support of weapons procured to support the Regionally Aligned Forces training mission. Will conduct safety assessments of limited distribution materiel systems considered for Table of Organization and Equipment (TOE) and Common Table of Allowances (CTA) approvals. Continue to conduct market research of commercially available weapon systems. Protective Weapons Coatings/Low Plasticity Burnishing will continue to develop manufacturing technology to support production of super hydrophobic and other coatings in support of preserving barrel and bolt life of small arms weapons while improving readiness. Continue to assess and evaluate current manufacturing process studies and assessments to adapt the coating technology into weapon Original Equipment Manufacturer manufacturing processes. Solid State Active Denial System will continue to monitor status of Capability Development Document and provide input into other programmatic documents as necessary. Will continue work to complete maturation of design. Individual Non-Lethal System will mature and complete prototype design for integration into a full system. Will prepare for proof of concept and design test efforts at Government facility in support of Milestone B. New Start in FY 2020.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Armaments for Robots will continue intelligence/networking and weapons design and functions for a man-in-the-loop, small caliber defensive armaments system on an unmanned ground vehicle including the Warfighter/Robot interface. Recoil Reduction Mechanisms will continue to assess and evaluate selected Recoil Reduction Mechanisms prototypes to be fabricated and tested for both individual and crew served weapons. Current and Legacy Weapon Improvements will continue to assess and evaluate selected capabilities and improvements for all current and legacy weapon systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funds required to reduce technology risk and to determine the appropriate set of technologies required to complete Next Generation Weapons technology development phase.			
Title: Ammunition ***Description:*** Small arms ammunition improvement. ***FY 2020 Plans:*** Ammunition Upgrades: Continued to evaluate the effect of new ammunition on small arms weapon systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding due to a lack of Ammo requirements.	0.130	0.100	-
Title: Combat Optics ***Description:*** Improvement of small arms combat optics. ***FY 2020 Plans:*** FY 2020 New Start: Next Generation Optics: Integrated current and emerging target acquisition component technologies into a variable magnification spotting scope and into binoculars. ***FY 2021 Plans:*** Next Generation Optics: Will continue to integrate current and emerging target acquisition component technologies into binoculars and variable magnification spotting scopes. Will continue to evaluate state of the art advances in optical component technologies for inclusion in future combat optic products.	0.137	0.100	0.100
Title: Fire Control ***Description:*** Small arms fire control.	4.721	4.000	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Next Generation Fire Control Technology Enhancements continued to support technology integration with Next Generation Squad Weapons, and specifically address decrease soldier aim error, decrease engagement time and increase probability of hit. Prototype demonstrations had application in individual and crew served weapons to enhance and upgrade Fire Control. ***FY 2021 Plans:*** Next Generation Fire Control Technology Enhancements will continue to support technology integration with Next Generation Weapons addressing soldier aim error, engagement time, probability of hit, situational awareness, lethality, and soldier acceptance. Iterative prototyping will be utilized to develop component technologies to support future variants of the Next Generation Squad Weapon. Technology may include enhanced camera based technology, target tracking, automatic target detection, increased networked lethality, reduced signature, increased user acceptance, along with other emerging weapon, ammunition, and fire control technologies that will increase the lethality of the next generation squad weapons. Small Arms Fire Control Enhancements will continue research test and evaluation efforts on laser based wind sensors, proof-of-concept devices, and other optical designs for prototypes that incorporate fire control sensors and ballistic solver software and integration of sensor input and communication with ammunition for all small arms weapon platforms.			
Title: Research and Analysis ***Description:*** Research and analysis of small arms. ***FY 2020 Plans:*** Continued to initiate Market Research and Benefit Analysis of 360 degree situational awareness, active stabilization, advanced kinetic weapons, low flying drone engagement, and other small arms research. ***FY 2021 Plans:*** Plan to continue Market Research and Benefit Analysis of 360 degree situational awareness, active stabilization, advanced kinetic weapons, low flying drone engagement, and other small arms research to include new technologies in emerging robotic and aerial armaments. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase in funds required to explore emerging technologies in robotic and aerial armaments.	0.267	0.200	0.747
Accomplishments/Planned Programs Subtotals	7.395	14.555	16.082

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EW4: *Crew Served Weapons Engineering Development*	25.058	4.089	4.263	-	4.263	4.285	4.423	4.525	4.498	0.000	51.141
• FF2: *Small Arms Fire Control*	4.094	14.700	10.153	-	10.153	11.244	7.993	9.991	9.992	0.000	68.167
• FI2: *Lightweight 30mm Cannon*	-	1.384	0.000	-	0.000	-	-	-	-	0.000	1.384
• FM4: *Next Generation Squad Weapons*	-	33.080	44.837	-	44.837	13.767	15.456	16.045	10.991	0.000	134.176
• S63: *Individual Weapons Engineering Development*	12.454	2.697	4.374	-	4.374	4.214	4.280	4.270	4.216	0.000	36.505
• FL4: *Small Caliber Ammo for Next Gen Squad Weapons*	-	18.180	30.600	-	30.600	28.723	24.976	11.739	11.858	0.000	126.076
• 627: *Jt Svc Sa Prog (JSSAP)*	5.708	-	0.000	-	0.000	-	-	-	-	0.000	5.708
• E06002: *NEXT GENERATION COMBAT ROUND*	-	-	11.988	-	11.988	20.519	60.880	187.813	189.692	0.000	470.892

Remarks

In support of Small Arms Initial Capability and Capability Development Requirements, advanced technology of small arms weapon systems is transitioned from Joint Service Small Arms Program (JSSAP), Project 627, Program Element 0603607A, (Budget Activity 3) to Small Arms Improvement, Project S54, Program Element 0603827A, (Budget Activity 4). After the technology is demonstrated and/or validated, the program transitions to Infantry Support Weapons, Program Element 0604601A, (Budget Activity 5) for engineering and manufacturing development.

D. Acquisition Strategy

Primary strategy is to study, develop, demonstrate and evaluate emerging technologies that ultimately lead to modernizing, enhancing and/or improving the small arms inventory.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S54 / *Small Arms Improvement*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Allot	PM Soldier Weapons, : Picatinny Arsenal	6.904	0.582	Mar 2019	0.590	Mar 2020	0.560	Mar 2021	-		0.560	Continuing	Continuing	Continuing
FY2019 SBIR / STTR Transfer	FFRDC	Army Budget Office : Pentagon, Washington DC	-	0.282	Nov 2018	-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	6.904	0.864		0.590		0.560		-		0.560	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware Development	MIPR	Army Research Development Engineering Centers, : Multiple	33.723	3.680	Mar 2019	9.755	Mar 2020	10.505	Mar 2021	-		10.505	Continuing	Continuing	Continuing
		Subtotal	33.723	3.680		9.755		10.505		-		10.505	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering	MIPR	Army Research Development Engineering Centers, : Multiple	27.051	1.162	Mar 2019	2.240	Mar 2020	2.240	Mar 2021	-		2.240	Continuing	Continuing	Continuing
		Subtotal	27.051	1.162		2.240		2.240		-		2.240	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) S54 / *Small Arms Improvement*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Testing	MIPR	Army Test and Evaluation Centers, : Multiple	15.008	1.689	Mar 2019	1.970	Mar 2020	2.777	Mar 2021	-		2.777	Continuing	Continuing	Continuing
		Subtotal	15.008	1.689		1.970		2.777		-		2.777	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	82.686	7.395		14.555		16.082		-		16.082	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

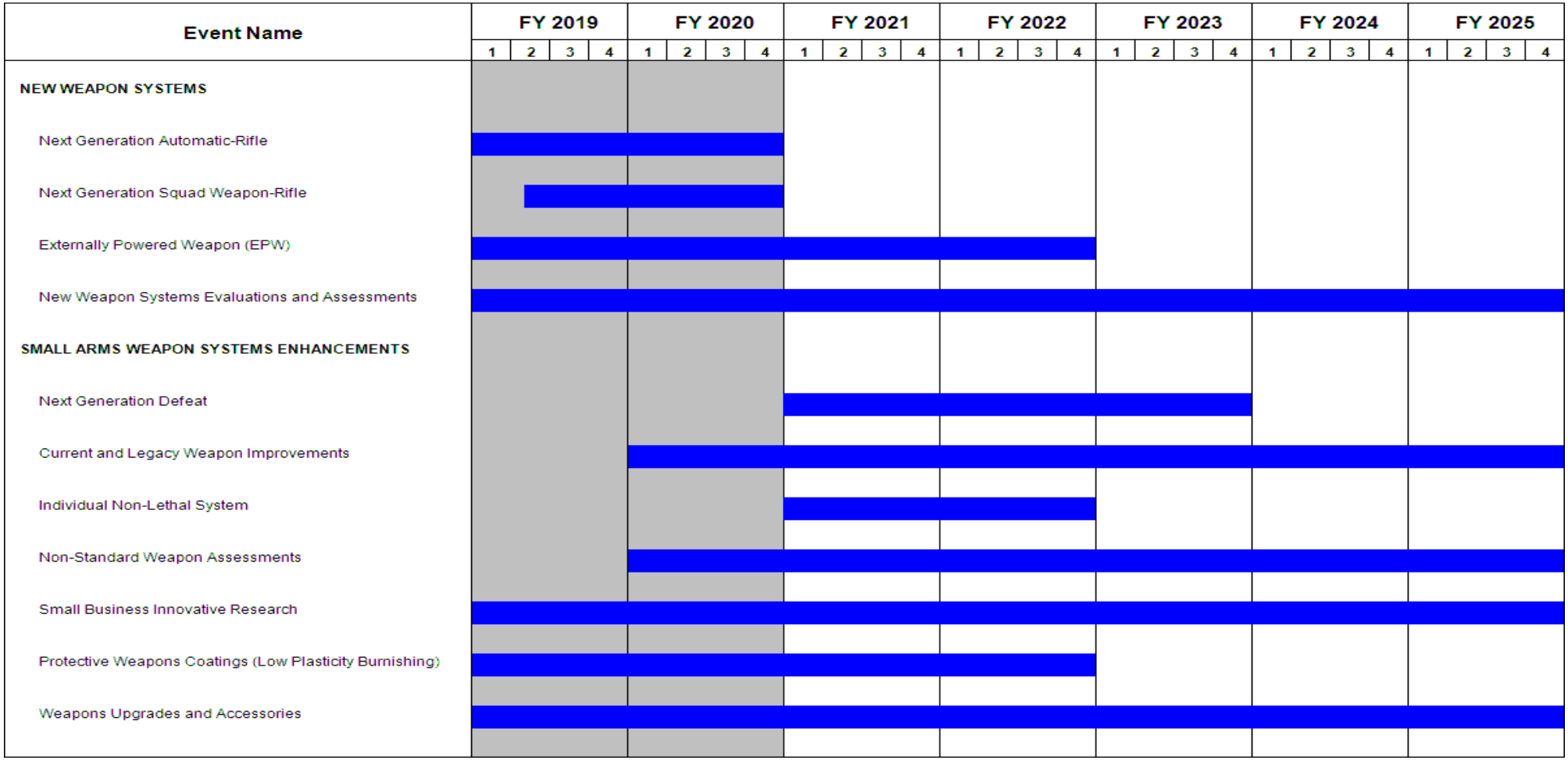


Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

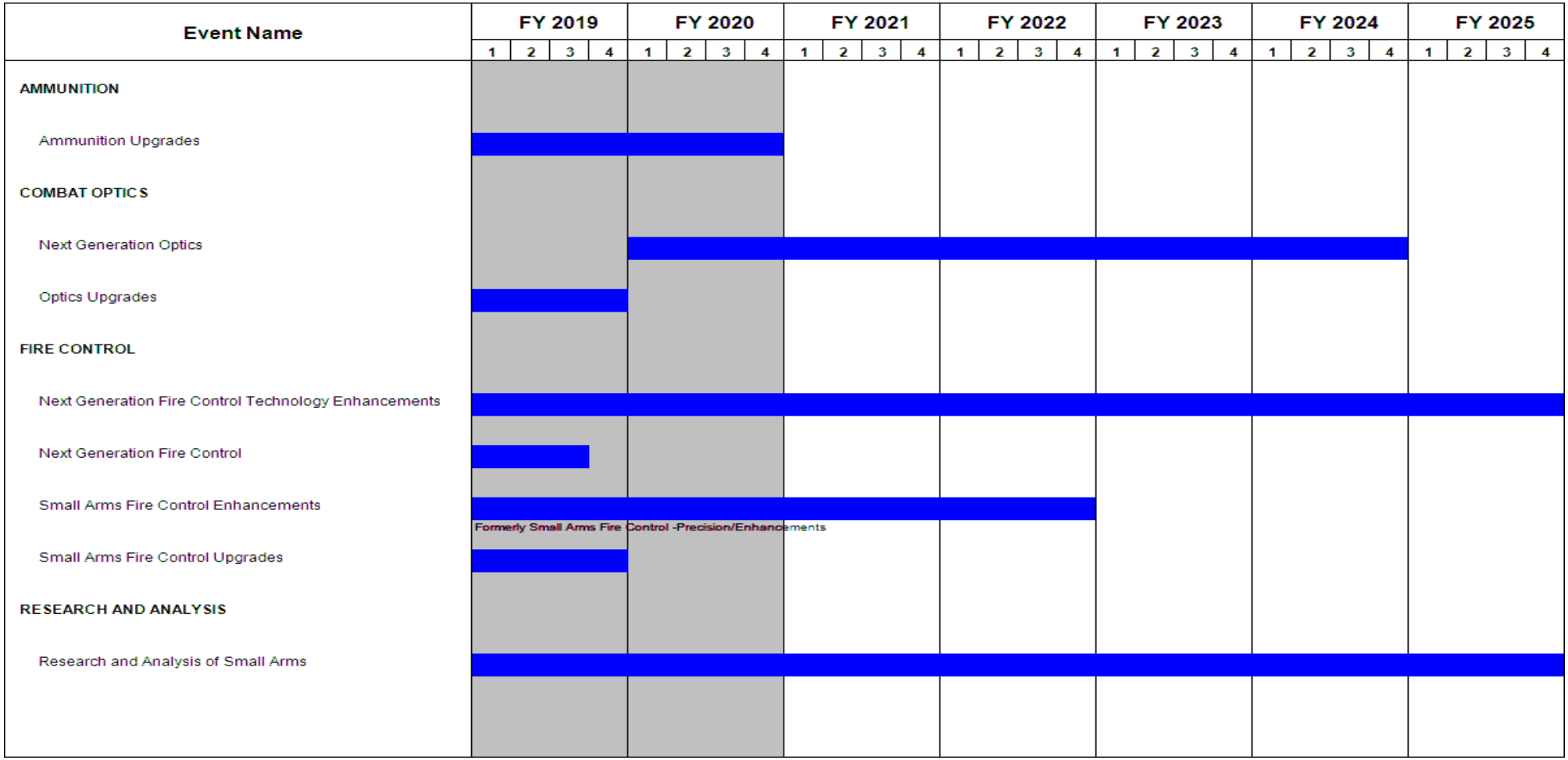


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
NEW WEAPON SYSTEMS	1	2008	4	2025
Next Generation Automatic-Rifle	1	2014	4	2020
Next Generation Squad Weapon-Rifle	2	2019	4	2020
Externally Powered Weapon (EPW)	1	2015	4	2022
New Weapon Systems Evaluations and Assessments	1	2017	4	2025
SMALL ARMS WEAPON SYSTEMS ENHANCEMENTS	1	2008	4	2025
Next Generation Defeat	1	2021	4	2023
Current and Legacy Weapon Improvements	1	2020	4	2025
Individual Non-Lethal System	1	2021	4	2022
Non-Standard Weapon Assessments	1	2020	4	2025
Small Business Innovative Research	1	2015	4	2025
Protective Weapons Coatings (Low Plasticity Burnishing)	1	2016	4	2022
Weapons Upgrades and Accessories	1	2010	4	2025
AMMUNITION	1	2008	4	2020
Ammunition Upgrades	1	2016	4	2020
COMBAT OPTICS	1	2008	4	2025
Next Generation Optics	1	2020	4	2024
Optics Upgrades	1	2016	4	2019
FIRE CONTROL	1	2008	4	2025
Next Generation Fire Control Technology Enhancements	1	2019	4	2025
Next Generation Fire Control	1	2017	3	2019
Small Arms Fire Control Enhancements	1	2017	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** S54 / *Small Arms Improvement*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Small Arms Fire Control Upgrades	1	2008	4	2019
RESEARCH AND ANALYSIS	1	2012	4	2025
Research and Analysis of Small Arms	1	2015	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) VS4 / *Soldier Protective Equipment*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VS4: *Soldier Protective Equipment*	-	20.828	2.836	4.441	-	4.441	4.905	6.482	8.143	8.143	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding in this project supports the Army's Cross Functional Teams' (CFT) initiatives. This Project supports efforts to evaluate integrated technologies and representative or prototype systems that help expedite Personal Protective Equipment (PPE) technology transition from the laboratory to operational use. This project will transition capabilities from our Science and Technology partners to increase performance and safety of Soldier clothing and protective equipment. It will continue to support cross-service initiatives to increase commonality.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Soldier Protective Equipment (SPE)	20.828	2.836	4.441

Description: Effort to increase Warfighter survivability and mobility by optimizing Soldier protection while effectively managing all life cycle aspects of Personal Protective Equipment (PPE).

FY 2020 Plans:

This project executing at a reduced level of effort from FY19, will continue Technology/Maturation and Risk Reduction efforts across the PPE portfolio: Torso and Extremity Protection (TEP); Vital Torso Protection (VTP); Integrated Head Protection System (IHPS); and Transition Combat Eye Protection (TCEP) to support SPS requirements for lighter-weight ballistic materials with improved performance and manufacturing/ testing process improvements. As new materials are ready, the Product Management Office will evaluate upgrades and inform stakeholders of new operational capabilities and then incorporate them into SPS designs as appropriate. Continue efforts to characterize and increase durability, shelf life, and functional service life of existing personal protective systems at the subsystem/component level. Continue the development of improved measurement processes for existing systems and emerging requirements.

FY 2021 Plans:

Project will continue Technology/Maturation and Risk Reduction efforts across the PPE portfolio: Torso and Extremity Protection (TEP); Vital Torso Protection (VTP); Integrated Head Protection System (IHPS); and Military Combat Eye Protection (MCEP) to support SPS requirements for lighter-weight ballistic materials with improved performance and manufacturing/ testing process improvements. If new materials are ready, the Product Management Office will evaluate upgrades and inform stakeholders of new operational capabilities and then incorporate them into SPS designs as appropriate. Continue efforts to characterize and increase

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** VS4 / *Soldier Protective Equipment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
durability, shelf life, and functional service life of existing personal protective systems at the subsystem/component level. Continue the development of improved measurement processes for existing systems and emerging requirements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change in Soldier Protective Equipment portfolio is due to anticipated requirement changes in FY 2020 and FY 2021 that result in a increase level of effort to address emerging threats.			
Accomplishments/Planned Programs Subtotals	20.828	2.836	4.441

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• VS5: *Soldier Protective Equipment*	4.667	6.627	8.319	-	8.319	9.656	9.480	8.498	9.063	0.000	56.310
• 121017: *Central Issue Facilities/Initial Issue: Organization/Clothing/Equipment*	-	-	-	-	-	-	-	-	-		

Remarks

D. Acquisition Strategy

Programs pursue technology transition from science and technology, maturation, and prototype development, culminating in the transition of mature technologies (Technology Readiness Levels (TRL) 6-7) to Engineering and Manufacturing Development. This Project continues to exercise competitively awarded contracts using best value source selection procedures where applicable.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) VS4 / *Soldier Protective Equipment*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Allot	PM SPIE Various : Various	2.212	0.934		0.400		0.782		-		0.782	Continuing	Continuing	Continuing
		Subtotal	2.212	0.934		0.400		0.782		-		0.782	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dev/Sys Engineering Spt	MIPR	Various : Various	8.502	0.400		0.750		0.500		-		0.500	Continuing	Continuing	Continuing
Dev/Integ Contracts	TBD	Various : Various	60.168	17.609		1.000		2.509		-		2.509	Continuing	Continuing	Continuing
FY 2019 FFRDC / SBIR / STTR	TBD	TBD : TBD	-	0.308		-		-		-		-	0.000	0.308	-
		Subtotal	68.670	18.317		1.750		3.009		-		3.009	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Misc Support Costs	MIPR	Various : Various	4.757	0.664		0.200		-		-		-	Continuing	Continuing	Continuing
		Subtotal	4.757	0.664		0.200		-		-		-	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ballistic/Blast/Nonballistic Testing	MIPR	Various : Various	17.782	0.913		0.486		0.650		-		0.650	Continuing	Continuing	Continuing
		Subtotal	17.782	0.913		0.486		0.650		-		0.650	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / *Soldier Systems - Advanced Development*	Project (Number/Name) VS4 / *Soldier Protective Equipment*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	93.421	20.828		2.836		4.441		-		4.441	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** VS4 / *Soldier Protective Equipment*

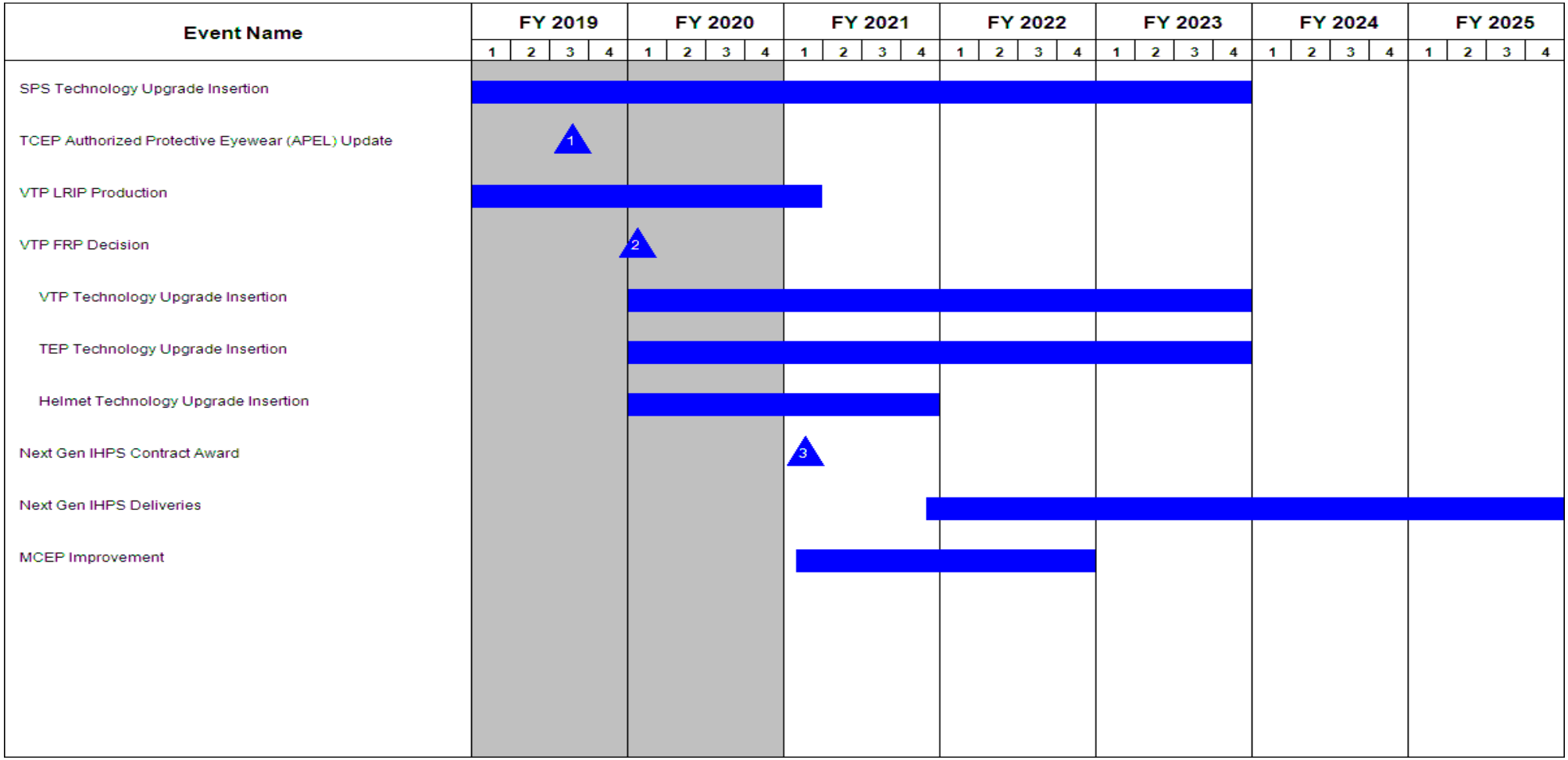


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0603827A / *Soldier Systems - Advanced Development*	**Project (Number/Name)** VS4 / *Soldier Protective Equipment*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
SPS Technology Upgrade Insertion	1	2017	4	2023
TCEP Authorized Protective Eyewear (APEL) Update	3	2019	3	2019
VTP LRIP Production	1	2017	1	2021
VTP FRP Decision	1	2020	1	2020
VTP Technology Upgrade Insertion	1	2020	4	2023
TEP Technology Upgrade Insertion	1	2020	4	2023
Helmet Technology Upgrade Insertion	1	2020	4	2021
Next Gen IHPS Contract Award	1	2021	1	2021
Next Gen IHPS Deliveries	4	2021	4	2025
MCEP Improvement	1	2021	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	70.745	84.381	121.207	-	121.207	144.629	146.620	146.708	146.728	0.000	861.018
CF4: *Robotic Combat Vehicle (RCV) NGCV-CFT*	-	0.000	78.559	114.889	-	114.889	139.867	141.868	141.868	141.878	0.000	758.929
FD2: *Soldier Robotics Systems*	-	2.056	2.771	3.258	-	3.258	1.753	1.791	1.834	1.836	0.000	15.299
FD3: *Battery Modernization & Interface Standardization*	-	0.821	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.821
FD9: *Robotics Systems*	-	67.868	3.051	3.060	-	3.060	3.009	2.961	3.006	3.014	0.000	85.969

A. Mission Description and Budget Item Justification

The Robotic Combat Vehicle (RCV) Prototyping effort will produce unmanned combat vehicle prototypes with the purpose of providing vehicles that Soldiers will use to develop new Concepts of Operations (CONOPS) and new requirements for unmanned combat vehicles to support Army Modernization priorities. RCV efforts will be executed in three (3) phases focused on increasing the complexity of RCV soldier maneuvers and expanding prototype platform capability. These efforts provide the basis for the Army to make the decision to move forward with a Robotic Combat Vehicle program transitioning from Technology Demonstrations to a Program of Record through Modeling and Simulation (M&S) development, initial prototype testing and iterative Soldier evaluations. This will stress the autonomy systems developed within the Science and Technology (S&T) base, assist the Next Generation Combat Vehicles Cross Functional Team (NGCV CFT) with refining RCV requirements, and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUM-T) in combat relevant missions.

Soldier Robotics Systems for Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. Joint Capabilites Integration and Development System, Department Directed, etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/transition from S&T projects, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for robotic systems that are transported by vehicle and maneuver under their own power.

The Battery Modernization & Interface Standardization (BMIS) program was established to help bring greater power efficiency and effectiveness to the dismounted Soldier and reduce the proliferation of proprietary batteries across the Army. BMIS will develop the Army Standard Family of Batteries (SFoB), a central acquisition management authority, and reduce 38 Communications-Electronics (C-E) battery types, currently in use, to just 3. Battery standardization and policy enforcement will support Operational Readiness at a reduced cost to the Army while maintaining configuration management, life cycle support, safety standards, and technological upgrades.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*

Robotics Systems for Applique and Large Unmanned Ground Systems (ALUGS) RD improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/Letter of Sufficiency determinations, market research, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/transition from S&T projects, MDD, and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for large robotic systems that are transported by vehicle, maneuver under their own power, or are installed as robotic applique kits. Research Development Technology Evaluation (RDTE) funds enable support to capability development of emerging systems currently including Tactical Wheeled Vehicle - Leader Follower (TWV-LF), Assault Breacher Vehicle (ABV), Dismounted Engineer Mobility System (DEMS), and Modular Mission Payloads (MMP). Funds prepare these capabilities for entrance into the Defense Acquisition System (i.e. Milestone decision). RDTE Product Manager Applique and Large Unmanned Ground Systems funding supports Leader Follower and ABV program transitions from Technology Demonstrations to Program of Record through Modeling and Simulation (M&S) development and initial prototype testing. This will stress the autonomy systems and ultimately reduce Program of Record testing requirements, technical risks, and costs through studies and validated simulations. Funding also supports the exploration and development of Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV), and 915 truck fleets) beyond the Palletized Load System (PLS) and applique kits on existing Tactical Wheeled Vehicles.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	74.368	115.222	105.332	-	105.332
Current President's Budget	70.745	84.381	121.207	-	121.207
Total Adjustments	-3.623	-30.841	15.875	-	15.875
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-30.841			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.623	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	15.875	-	15.875

Change Summary Explanation

FY 2021 increase of $15.992 million aligns program requirements with Army modernization priorities for Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
CF4: *Robotic Combat Vehicle (RCV) NGCV-CFT*	-	0.000	78.559	114.889	-	114.889	139.867	141.868	141.868	141.878	0.000	758.929
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Robotic Combat Vehicle (RCV) Prototyping effort will produce unmanned combat vehicle prototypes with the purpose of providing vehicles that Soldiers will use to develop new Concepts of Operations (CONOPS) and new requirements for unmanned combat vehicles to support Army Modernization priorities. RCV efforts will be executed in three (3) phases focused on increasing the complexity of RCV soldier maneuvers and expanding prototype platform capability. These efforts provide the basis for the Army to make the decision to move forward with a Robotic Combat Vehicle program transitioning from Technology Demonstrations to a Program of Record through Modeling and Simulation (M&S) development, initial prototype testing and iterative Soldier evaluations. This will stress the autonomy systems developed within the Science and Technology (S&T) base, assist the Next Generation Combat Vehicles Cross Functional Team (NGCV CFT) with refining RCV requirements, and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUM-T) in combat relevant missions.

In order to accelerate user involvement with RCV platform capabilities, an RCV Prototyping effort will be executed through a three (3) phase activity. The RCV surrogate platform build (Phase 1) was initiated in Fiscal Year (FY) 2019 under 0604017A Robotics Development, Project FD9 Robotics Systems and will conclude in this project with test and demonstration. This project will finalize Phase 1's rapid prototype build of surrogate RCV platforms using existing robotized vehicles and conduct Soldier evaluations at the platoon level (4 RCVs) through MUM-T evaluations. In order to conduct larger scale MUM-T maneuvers and to continue to advance the autonomous performance of the robotic platforms, two additional platoons of RCVs will be built leveraging existing contractor unmanned platforms for a total of a company set (12) RCVs. The company of RCVs (Phase 2) will be used for a second round of Soldier experimentation building off of the platoon exercises and providing additional refinement of CONOPs/TTPs.

The RCV Phase 3 prototyping will build off lessons learned in Phases 1 and 2 and develop and produce innovative, unmanned platforms that investigate different approaches to solving challenges and building on opportunities in Phases 1 and 2 to include looking at different weight class RCV platform and new modular mission payloads for RCV platforms. The intent is to award a minimum of two contracts to design and build up to a company set (12) RCV platforms for user evaluation and experimentation starting at the end of FY 2024. The RCV platforms will incorporate mature technology capabilities transitioned from S&T as they become available to include the latest autonomous mobility capability, improved user control interfaces and advanced sensing and aided target recognition. The Phase 3 RCV platform requirements will be informed by the initial platoon and company experimentation (Phase 1 and 2) and Soldier feedback.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Robotic Combat Vehicle (RCV) ? Prototype Platforms	-	65.534	86.227
Description: RCV ? Prototype Platforms effort will produce unmanned combat vehicle prototypes with the purpose of creating an experimental unit that Soldiers will use to create new CONOPS and new requirements for unmanned combat vehicles to			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
support Army Modernization priorities. Several variants of prototypes will be created, starting first with surrogate platforms which adapt existing platforms into surrogate RCVs for early experimentation in several different weight classes. Based off of lessons learned from the surrogate vehicle builds, platforms optimized to be RCVs will be built which maximize the capability advantages that unmanned platforms can offer such as reduced platform size and weight. The platforms will be built with the purpose of going through Army Test & Evaluation Center (ATEC) safety release and ultimately for Soldier evaluation through iterative User experimentation. ***FY 2020 Plans:*** In FY 2020, contracts for surrogate RCVs (Phase 2) using existing platforms were awarded to up to two (2) contractors based off of requirements generated from a platform evaluation funded under Program Element (PE) 0605053A Ground Robotics, Project FB7 Robotics Enhancement Program (REP). Surrogate RCV platforms focused on reconnaissance and decisive lethality mission roles. Direct fire, missile systems and advanced sensors were integrated on to the platforms designed for remote operation. Remote mobility functions were improved and autonomy sensor suite were integrated to ensure safety critical operation for ATEC safety assessment in FY 2021. These platforms were combined with M113 surrogates built under PE 0604017A Robotics Development, Project FD9 Robotics Systems in FY 2019 for company level RCV Surrogate Experimentation scheduled in FY 2021. ***FY 2021 Plans:*** Phase 2 light and medium RCV prototype integration of autonomy software, sensors, and lethality systems, delivering prototypes for test and evaluation will be completed. This will transition updated aided-target-recognition and navigation algorithms to Phase 1 and Phase 2 surrogate systems for Phase 2 experimentation. The concept and detailed design of the Phase 3 RCV prototypes will begin and as well as the fabrication and purchase of long-lead components and sub-systems including powertrain, energy storage, sensors, and lethality systems. Phase 3 prototype platforms will focus on decisive lethality mission roles, will be designed for remote operation and the integration of direct fire, missile systems and advanced sensors. Remote control software for modular mission packages including obscuration, electronic warfare, chemical-biological and other reconnaissance sensors will be matured and integrated. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY 2021, prototyping activities are primarily in support of Phase 3 prototypes, with increased operational performance requirements in areas of lethality, survivability, and operational mobility driving increases in platform non-recurring engineering and prototyping costs in comparison to Phase 2 platforms primarily funded in FY 2020.			
Title: Robotic Combat Vehicle ? Modeling and Simulation	-	2.017	7.542
Description: RCV Modeling and Simulation effort will produce the ability to experiment in a virtual environment to conduct data collection and results that will form the physical testing desires. This will provide the initial data set to inform the operational			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
experimentation in the RCV Campaign of Learning as well as feed initial data to the Requirements Community as they build new MUM-T, CONOPs and TTPs. As test data is collected, high fidelity simulations for unmanned operation of combat platforms will be refined in a virtual test environment to enable virtual test ? fix ? test cycles in a virtual developmental space. ***FY 2020 Plans:*** This effort conducted a series of virtual experiments of multiple RCV concepts in different weight-class designs that factor in the mobility, lethality, and aided target recognition systems (AiTR) capabilities using accurate technology models simulated in an operational environment and tested with trained soldiers to provide a RCV understanding for future Brigade Combat Team (BCT) formations. The models were based upon input from industry science advisory groups to inform near-term art-of-the-possible. Soldier feedback on how to implement that was assessed to help inform the purpose built prototype and evaluate capability sets in platoon level force-on-force simulation experimentation. ***FY 2021 Plans:*** This effort will continue the series of virtual experiments for Phase 3 RCV concepts, evaluating initial designs that factor in the mobility, lethality, and AiTR capabilities using accurate technology models simulated in an operational environment and tested with trained soldiers to provide a RCV understanding for future BCT formations. The models will inform the soldier-operational experiment and the tactics, techniques, and procedures employed. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase of funding in FY 2021 is due to delayed start of RCV Phase 3 which delays start of Phase 3 simulation activities until FY2021.			
Title: Robotic Combat Vehicle ? Testing and Evaluation ***Description:*** RCV Testing effort will perform system verification testing and system safety testing on the RCV surrogate platforms and purpose-built platforms. This will expose unexpected issues and ensure that the RCV systems are safe for Soldier operation prior to conducting Field Experimentation. ***FY 2020 Plans:*** RCV Risk Reduction effort completed safety testing on the integrated Phase 1 surrogate platforms. Following safety testing, the surrogate platforms began the Soldier MUM-T Experimentation to receive User assessment on the performance of the vehicles and to begin CONOP and TTP development based on actual system performance. Surrogate RCV platforms are controlled by manned fighting control vehicles developed under PE 0603645A Armored Systems Modernization Adv Dev, Project EV7 Combat Vehicle Prototyping during the Soldier MUM-T Experimentation. ***FY 2021 Plans:***	-	2.552	14.071

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Phase 2 platforms will conduct system verification testing and go through a full range of shakedown tests to ensure platforms are ready to begin safety testing. Platforms will then move into safety release testing at Army Test and Evaluation Command to begin the evaluation process for a Safety Release for Soldier use of the RCV vehicles. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in the FY 2021 funding is due to the increase in the number of RCV systems being tested. It will increase from quantity four (4) to twelve (12), requiring additional test personnel, field-service representatives, maintenance, and logistics. System lethality capabilities will progress from small-caliber to medium-caliber, requiring increased levels of safety qualification testing.			
Title: Robotic Combat Vehicle ? Program Management ***Description:*** RCV Program Management effort will enable RCV concepting, modeling and simulation, detailed design, system integration and build, testing, and all Manned Unmanned Teaming Field Experimentation. ***FY 2020 Plans:*** This effort managed all activity under the RCV line of effort to include but not limited to government and contractor labor, travel, supplies, equipment and facilities. Managed RCV concept development, analysis, and modeling and simulation of RCV concepts. Managed detailed design, build integration, and evaluation of the RCV platform solutions. Managed the execution of the Phase 1 testing and operational experimentation. ***FY 2021 Plans:*** Funding supports the Program Management Office (PMO) acquisition, analysis of alternatives, development of the request for proposal, and initiation of milestone documentation. This funding also includes risk assessment, mitigation efforts, contract preparation, industry analysis, and feedback sessions, to include government and contractor labor, travel, supplies, equipment and facilities. This will also manage detailed design, build, integration, and evaluation of the RCV platform solutions and the execution of the Phase 2 testing and operational experimentation and Phase 3 systems engineering, design and integration. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in the FY 2021 funding will continue to support conclusion of Phase 2 and the increase in additional personnel required to support the RCV Phase 3 systems concept development, engineering, detailed design for the RCV purpose-built vehicles and the PM acquisition support.	-	4.889	7.049
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:***	-	3.567	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638			
Accomplishments/Planned Programs Subtotals	-	78.559	114.889

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The RCV program will provide unmanned combat vehicles to enable users to assess the capability of the platforms and create new CONOPS and doctrine for manned/unmanned teaming based operations. Efforts will inform new ways to fight, identify system limitations and benefits, and provide an analytically backed basis for future RCV requirements documents to drive future acquisition programs.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Robotic Combat Vehicle - Program Management	MIPR	Various : Various	-	-		4.889	Oct 2019	7.049	Oct 2020	-		7.049	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		3.567		-		-		-	0.000	3.567	-
		Subtotal	-	-		8.456		7.049		-		7.049	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RCV Phase 2 Platform (Company Set)	C/FFP	TBD : TBD	-	-		65.534	Feb 2020	20.908	Nov 2020	-		20.908	Continuing	Continuing	Continuing
RCV Phase 3 Platform (Company Set)	C/CPFF	TBD : TDB	-	-		-		65.319	Mar 2021	-		65.319	Continuing	Continuing	Continuing
		Subtotal	-	-		65.534		86.227		-		86.227	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RCV Modeling and Simulation	MIPR	TBD : TBD	-	-		2.017	Oct 2019	7.542	Nov 2020	-		7.542	Continuing	Continuing	Continuing
RCV Test and Evaluation	MIPR	TBD : TBD	-	-		2.552	Oct 2019	14.071	Oct 2020	-		14.071	Continuing	Continuing	Continuing
		Subtotal	-	-		4.569		21.613		-		21.613	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		78.559		114.889		-		114.889	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

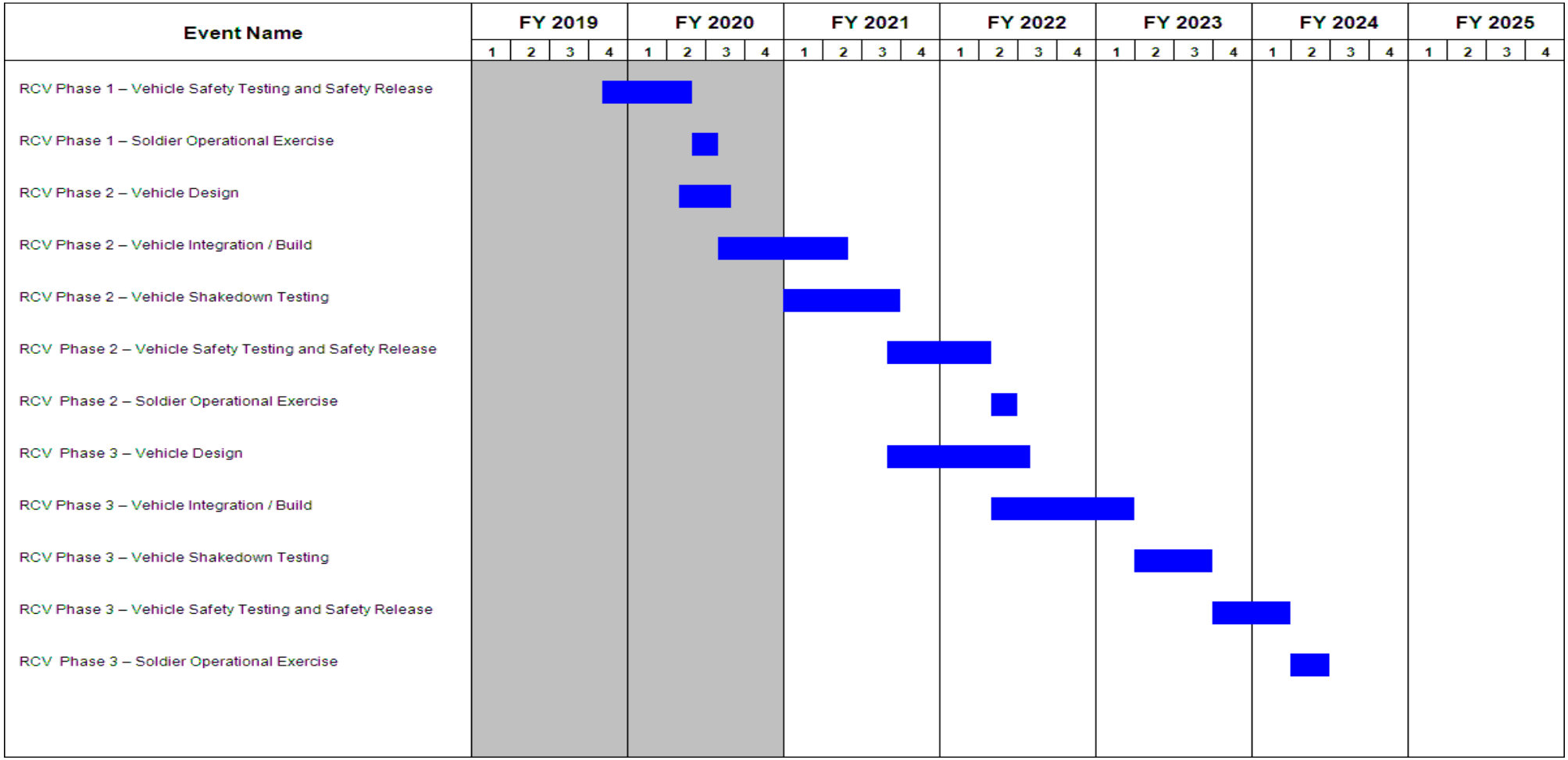

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
RCV Phase 1 ? Vehicle Safety Testing and Safety Release	4	2019	2	2020
RCV Phase 1 ? Soldier Operational Exercise	2	2020	3	2020
RCV Phase 2 ? Vehicle Design	2	2020	3	2020
RCV Phase 2 ? Vehicle Integration / Build	3	2020	2	2021
RCV Phase 2 ? Vehicle Shakedown Testing	1	2021	3	2021
RCV Phase 2 ? Vehicle Safety Testing and Safety Release	3	2021	2	2022
RCV Phase 2 ? Soldier Operational Exercise	2	2022	2	2022
RCV Phase 3 ? Vehicle Design	3	2021	3	2022
RCV Phase 3 ? Vehicle Integration / Build	2	2022	1	2023
RCV Phase 3 ? Vehicle Shakedown Testing	2	2023	3	2023
RCV Phase 3 ? Vehicle Safety Testing and Safety Release	4	2023	1	2024
RCV Phase 3 ? Soldier Operational Exercise	2	2024	2	2024

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FD2: *Soldier Robotics Systems*	-	2.056	2.771	3.258	-	3.258	1.753	1.791	1.834	1.836	0.000	15.299
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Pre-acquisition program activities funded by this line is expected to transition to a separate Program Element and Project prior to their first program acquisition Milestone (B or C).

A. Mission Description and Budget Item Justification

Soldier Robotics Systems for Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, Robotic & Autonomous Strategy (RAS), etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/ Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/ transition from Science & Technology (S&T) demonstration projects, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for robotic systems that are transported by vehicle and maneuver under their own power.
Funding supports modernization of the current Ground Robotic fleets by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts."

FY 2021 funding in the amount of $1.738 million supporting Unmanned Ground Vehicles program management activities including inter-service support, travel, conducting Analysis of Alternatives (AoA), draft performance specifications, prototype demonstrations, acquisition documents and request for proposal documentation on Enhanced Robotic Payload (ERP) programs, Chemical Biological Radiological and Nuclear (CBRN), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), and payload technology maturation efforts.

Funding supports modernization of the current Ground Robotic fleets by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

FY 2021 funding in the amount of $1.520 will support the analysis of the Soldier Exoskeleton technology that amplifies the strength, endurance, and mobility of its operator, the Soldier. The Soldier Exoskeleton capabilities provide the Army with a deployable, personal tactical performance enhancer. Soldier Exoskeleton variants will be capable of operating in a wide range of environments enhancing combat operations.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Soldier Borne Sensor (SBS) / Exoskeleton	1.484	1.450	1.520
Description: The SBS provides the small unit a "quick look" capability with improved Situational Awareness of routes, buildings, tunnels, obstacles blocking line of sight, and similar concealed threat locations. The budget activity enables payload improvements including camera enhancements, target identification algorithms, display/controller improvements and user notifications for specific items of interest. Soldier Exoskeleton variants, ranging from Commercial-Off-The-Shelf solutions, will be capable of operating in a wide range of environments enhancing combat operations. ***FY 2020 Plans:*** Will continue to provide for the capability of transitioning and continuing development of Industry and DoD Exoskeleton efforts to augment the warfighter strengths and human performance to reduce Soldier load. Continue to provide for the integration and evaluation of potential exoskeleton solutions and completion of initial technical and programmatic data to inform capability requirement generation and subsequent materiel development decision. ***FY 2021 Plans:*** Will continue to provide for the transitioning and continuing development of Industry and DoD efforts to augment the warfighter strengths and human performance to reduce Soldier load into a program of record. Evaluate potential exoskeleton solutions to refine operational requirements to inform capability requirement generation, Analysis of Alternatives and technical risk assessments to engage in early Soldier evaluations/feedback to reduce acquisition cost, schedule, and performance risk. Conduct key pre-acquisition activities to include initial document development such as; draft performance specifications, draft acquisition documents and draft contract documents and early development activities. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 increase supports continued evaluation of capabilities.			
Title: UGV Soldier Robotics Development	0.572	1.196	1.738
Description: Soldier Robotics Development is designed to facilitate the transition of robotics and autonomous systems technology into Programs of Record. It informs the acquisition process beforehand allowing the Maneuver Center of Excellence, Sustainment Center of Excellence, Maneuver Support Center of Excellence, and the Cyber Center of Excellence the ability to make integration decisions and affordability trades while writing requirements. UGV Robotics Development will fund Common Robotics System (Vehicle), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), Common Robotic System (Communication Link) (CRS(CL)), Common Robotic System (Mission Command/Artificial Intelligence) (CRS(MS/AI)), Render Safe - Sets, Kits and Outfits (RS-SKO), Enhanced Robotics Payload (ERP), payload technology maturation efforts, Chemical, Biological, Radiological, and Nuclear (CBRN); small, pocket sized, airborne sensors, etc. ***FY 2020 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding is provided for program management matrix support to include salaries and travel, conduct Analysis of Alternatives (AoA) on Enhanced Robotic Payload (ERP) programs, Chemical, Biological, Radiological, and Nuclear (CBRN), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), and payload technology maturation efforts. ***FY 2021 Plans:*** Funding is provided for program management matrix support to include salaries and travel, draft performance specifications, acquisition documents, prototype demonstrations, technology maturation, request for proposal documentations and conduct Analysis of Alternatives (AoA) on Enhanced Robotic Payload (ERP) programs, Chemical, Biological, Radiological, and Nuclear (CBRN), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), and payload technology maturation efforts. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase due to adjustments for cost in support of continued evaluation of capabilities.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	0.125	-
Accomplishments/Planned Programs Subtotals	2.056	2.771	3.258

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• FB8: *Soldier Borne Sensor (SBS)*	3.354	-	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• W63798: *Soldier Borne Sensor (SBS)*	24.437	23.362	18.907	-	18.907	18.141	19.081	19.273	19.168	Continuing	Continuing

Remarks

Pre-acquisition program activities funded by this line transition to a separate Program Element and Project prior to their first program acquisition Milestone (B or C).

D. Acquisition Strategy

Soldier Robotics Systems will utilize a Robotics Development funding for internal systems engineering, requirements and architecture analysis, AoAs and Technology Readiness Assessments with PdM UGV S&T partners, technology maturation efforts, and studies and analysis in support of program initiation with industry.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

Initial exoskeleton efforts will continue to assess Industry's and DoD emerging exoskeleton initiatives performance through Soldier demonstrations/feedback to inform capability requirement generation, technology maturation, studies and analysis to support acquisition activities leading to program initiation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UGV Program Management Support	MIPR	Multiple : Multiple	0.418	0.390	Feb 2019	0.368	Oct 2019	0.500	Oct 2020	-		0.500	0.000	1.676	Continuing
SBS and Exoskeleton Program Management Support	Various	Various : Multiple	0.330	1.484	Jun 2019	1.482	Mar 2020	1.520	Mar 2021	-		1.520	0.000	4.816	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.125		-		-		-	0.000	0.125	-
		Subtotal	0.748	1.874		1.975		2.020		-		2.020	0.000	6.617	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AoA CRS(H)	MIPR	Multiple : Various	0.258	-		-		-		-		-	0.000	0.258	-
AoA ERP	MIPR	Multiple : Various	0.421	0.085	Feb 2019	-		-		-		-	0.000	0.506	-
AoA CRS(LR)	MIPR	Multiple : Various	-	0.049	Feb 2019	-		-		-		-	0.000	0.049	-
Payload maturation and integration Studies	Various	Various : Multiple	-	-		0.398	Dec 2019	-		-		-	0.000	0.398	-
Capability Development Studies, Demonstration	Various	Various : Multiple	-	-		0.398	Dec 2019	-		-		-	0.000	0.398	-
JCAUS IOP V4	MIPR	ARDEC : Picatinny, NJ	0.050	-		-		-		-		-	0.000	0.050	-
FY 2019 SBIR /STTR Transfer	TBD	TBD : TBD	-	0.048	Oct 2018	-		-		-		-	0.000	0.048	-
		Subtotal	0.729	0.182		0.796		-		-		-	0.000	1.707	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Performance Spec Dev	MIPR	Various : Multiple	-	-		-		0.619	Feb 2021	-		0.619	0.000	0.619	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RFP and Acq Documentation	MIPR	Various : Multiple	-	-		-		0.619	Apr 2021	-		0.619	0.000	0.619	-
		Subtotal	-	-		-		1.238		-		1.238	0.000	1.238	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.477	2.056		2.771		3.258		-		3.258	0.000	9.562	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

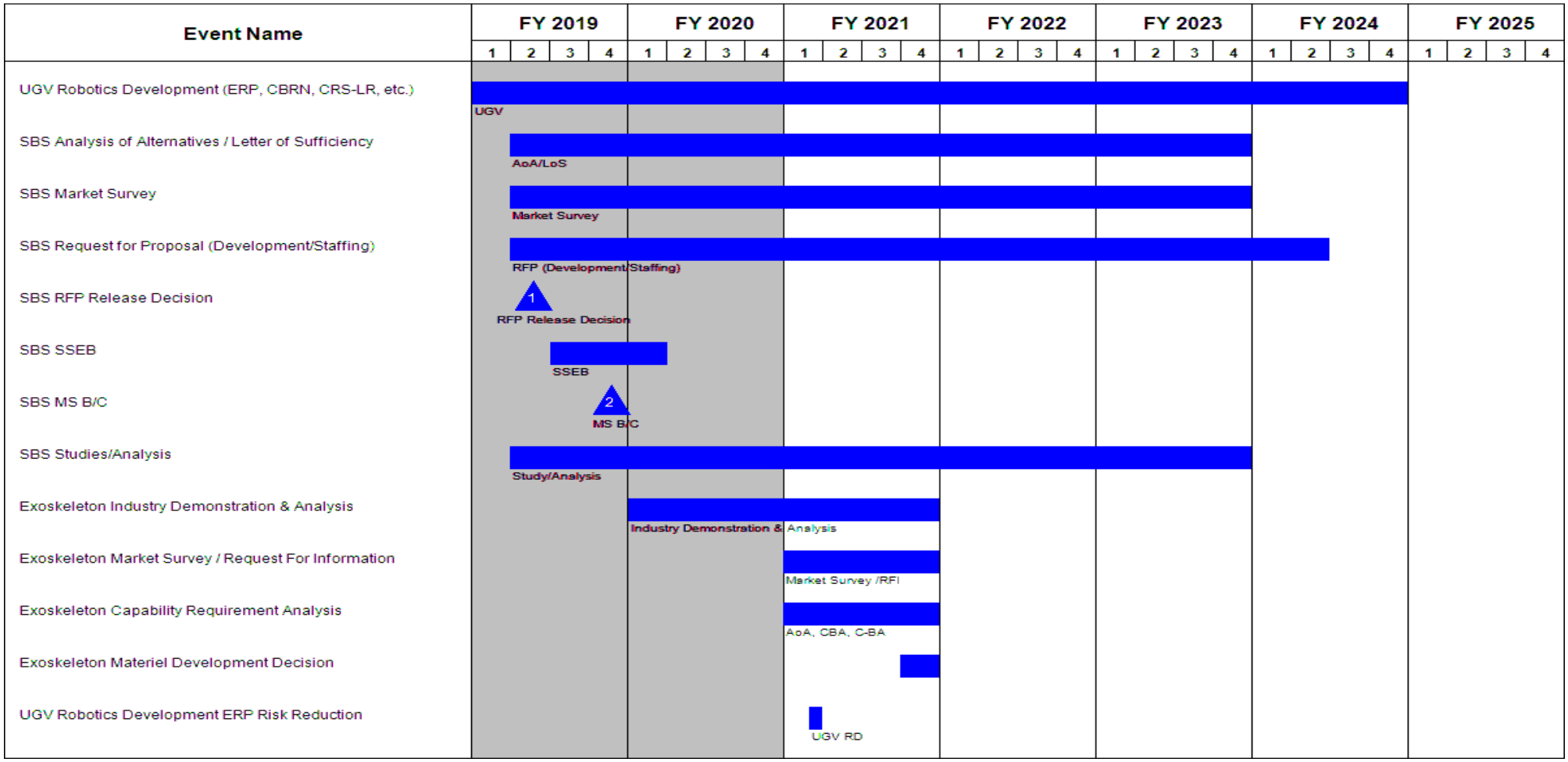

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
UGV Robotics Development (ERP, CBRN, CRS-LR, etc.)	1	2018	4	2024
SBS MDD	1	2018	1	2018
SBS Analysis of Alternatives / Letter of Sufficiency	1	2018	4	2023
SBS Market Survey	1	2018	4	2023
SBS Request for Proposal (Development/Staffing)	1	2018	2	2024
SBS RFP Release Decision	2	2019	2	2019
SBS SSEB	3	2019	1	2020
SBS MS B/C	4	2019	4	2019
SBS Studies/Analysis	1	2018	4	2023
Exoskeleton Industry Demonstration & Analysis	1	2020	4	2021
Exoskeleton Market Survey / Request For Information	1	2021	4	2021
Exoskeleton Capability Requirement Analysis	1	2021	4	2021
Exoskeleton Materiel Development Decision	4	2021	4	2021
UGV Robotics Development ERP Risk Reduction	1	2021	1	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD3 / *Battery Modernization & Interface Standardization*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FD3: *Battery Modernization & Interface Standardization*	-	0.821	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.821
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project FD3 efforts complete in FY 2019.

A. Mission Description and Budget Item Justification

The Battery Modernization & Interface Standardization (BMIS) program was established to help bring greater power efficiency and effectiveness to the dismounted Soldier and to reduce the proliferation of proprietary batteries across the Army. BMIS will develop the Army Standard Family of Batteries (SFoB), a central acquisition management authority, and reduce 38 Communications-Electronics (C-E) battery types, currently in use, to just 3. Expand to include batteries for generators and hybrids, robotics, vehicles, and low density/usage systems. Battery standardization and policy enforcement will support Operational Readiness at a reduced cost to the Army while maintaining configuration management, life cycle support, safety standards, and technological upgrades.

Funding supports modernization of the current battery types. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Acquisition Strategy ***Description:*** Complete advanced development pre-milestone B assessments and analysis.	0.210	-	-
Title: BMIS Standard Family of Batteries (SFoB) Design ***Description:*** Finalize research and complete assessment of technology and portfolios. Once the SFoB has been established, maintenance and updates will be made as technology advances.	0.611	-	-
Accomplishments/Planned Programs Subtotals	0.821	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD3 / *Battery Modernization & Interface Standardization*

D. Acquisition Strategy

BMIS will expand the Army Standard Family of Batteries to include C-E, batteries for generators and hybrids, robotics, vehicles, and low density/usage systems. BMIS will continue to investigate technology advancements of batteries for these systems and provide information and recommendations to applicable Program Managers.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD3 / *Battery Modernization & Interface Standardization*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
BMIS Design	Various	Various : Fort Belvoir	0.269	0.255		-		-		-		-	0.000	0.524	-
		Subtotal	0.269	0.255		-		-		-		-	0.000	0.524	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
BMIS SFoB Prototype Development	Various	Various : Fort Belvoir, VA	0.332	0.356		-		-		-		-	0.000	0.688	-
		Subtotal	0.332	0.356		-		-		-		-	0.000	0.688	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
BMIS Program Support	Various	Various : Fort Belvoir	0.212	0.210		-		-		-		-	0.000	0.422	-
		Subtotal	0.212	0.210		-		-		-		-	0.000	0.422	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.813	0.821		0.000		-		-		-	0.000	1.634	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD3 / *Battery Modernization & Interface Standardization*

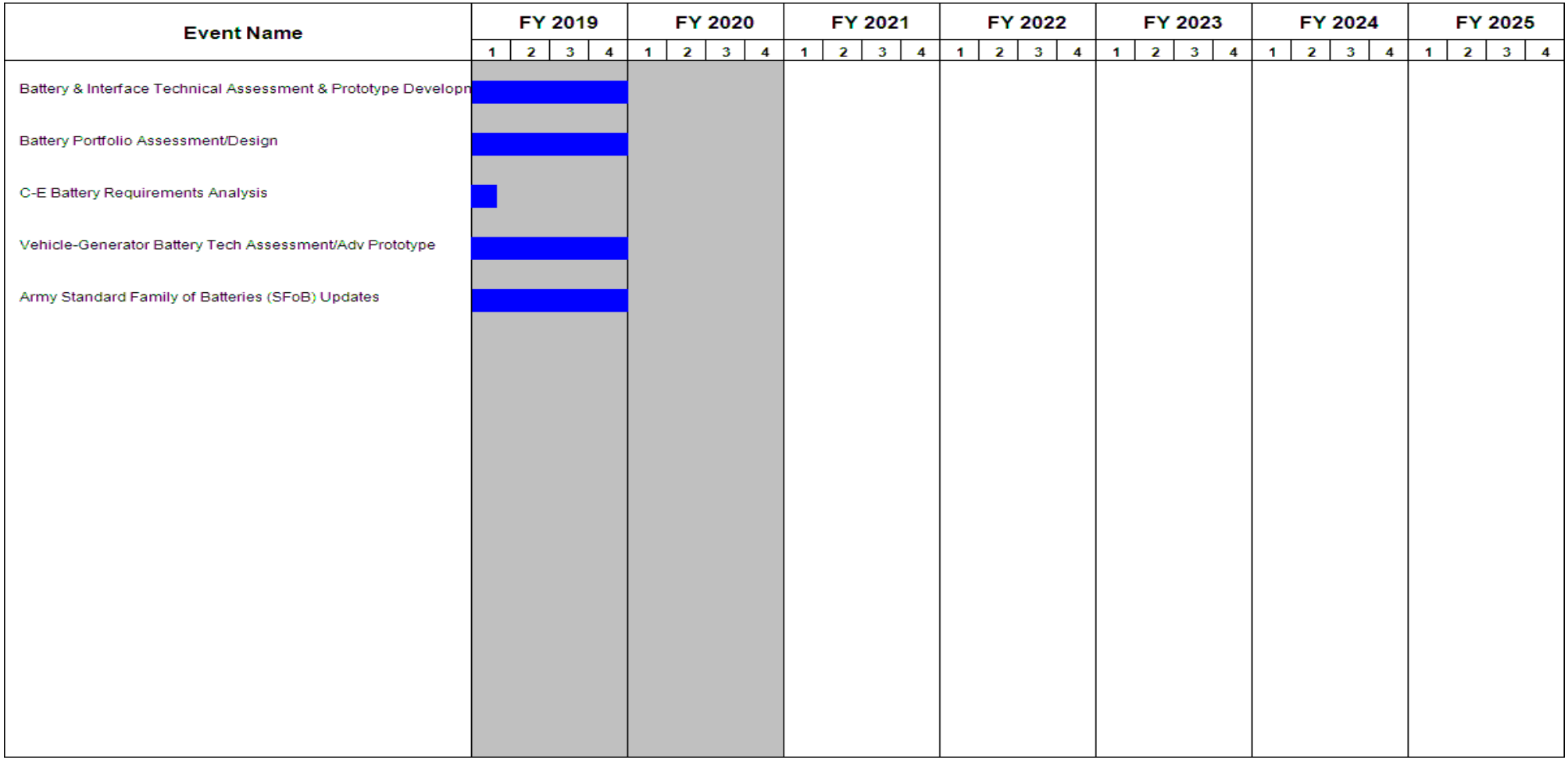

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD3 / *Battery Modernization & Interface Standardization*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Battery & Interface Technical Assessment & Prototype Development	1	2018	4	2019
Battery Portfolio Assessment/Design	1	2018	4	2019
C-E Battery Tech Assessment/Adv Prototype	1	2018	4	2018
C-E Battery Requirements Analysis	1	2018	1	2019
Vehicle-Generator Battery Tech Assessment/Adv Prototype	4	2018	4	2019
Army Standard Family of Batteries (SFoB) Updates	1	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FD9: *Robotics Systems*	-	67.868	3.051	3.060	-	3.060	3.009	2.961	3.006	3.014	0.000	85.969
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Robotics Systems for Applique and Large Unmanned Ground Systems (ALUGS) Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, etc.) and by maturing / transitioning technology. RDTE funds enable support to capability development of emerging systems currently including Tactical Wheeled Vehicle - Leader Follower (TWV-LF), Assault Breacher Vehicle (ABV), Dismounted Engineer Mobility System (DEMS), and Modular Mission Payloads (MMP). Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives / Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation / transition from Science & Technology (S&T) projects and Robotic Enhancement Program (REP) initiatives, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for large robotic systems that are transported by vehicle, maneuver under their own power, or are installed as robotic applique kits.

Funding will expand Modeling and Simulation (M&S) including Continuous Autonomy Simulation Test Laboratory Environment (CASTLE) capability to test and evaluate Manned Unmanned teaming, combat scenarios or other emerging Robotics program needs. RD funding will utilize the M&S environment to mature and evaluate S&T for inclusion to program requirements, Engineering Change Proposals (ECPs) and/or technical insertions, utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and CONOPS. In addition, RD funds exploration and development of the Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV) and 915 truck fleets) beyond the Palletized Load System (PLS).

Funding also supports modernization of the current Ground Robotic fleets and current Army vehicles by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding will also support developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Tactical Wheeled Vehicle - Leader Follower (TWV-LF) - RD for PdM Applique & Large Unmanned Ground Systems (ALUGS)	5.424	-	-
Description: Tactical Wheeled Vehicle (TWV) Leader Follower (LF) Program in PdM Applique & Large Unmanned Ground Systems (ALUGS) builds upon the Combat Capabilities Development Command (CCDC) Ground Vehicle Systems Center (GVSC) Expedient Leader Follower (ELF) Operational Technology Demonstration (OTD) to provide automation capability to the			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Palletized Load System (PLS) A1. Current PdM efforts will lay the groundwork for future Program of Record (PoR) capability, expanding the CCDC GVSC efforts to include up to seven (7) unmanned Follower vehicles. Funding will support cost, schedule and performance risk reduction efforts to include Capabilities Document input, close analysis of ELF OTD activities that feed cost estimates, capture technical and test data, provide test support, develop Modeling and Simulation (M&S) use cases, and develop a Software Integration Lab (SIL).			
Title: Emerging Robotics Systems ***Description:*** Validation and verification of incremental system software capability upgrades for emerging robotic systems through M&S Software-in-the-loop (SIL) and Hardware-in-the-loop (HIL) allowing for transition into Program of Record. ***FY 2020 Plans:*** FY 2020 funding will expand Modeling and Simulation including CASTLE capabilities to test and evaluate Manned Unmanned Teaming, combat scenarios or other emerging program needs. RD funding will utilize the M&S environment to mature and evaluate S&T for inclusion to program requirements, Engineering Change Proposals (ECPs) and/or technical insertions and various mission payload development, utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and CONOPS and continue validating simulation scenarios to expand test capability. Funding will support Rapid prototyping to inform emerging programs with a Buy, Try, Decide strategy. ***FY 2021 Plans:*** FY 2021 funding will expand Modeling and Simulation including CASTLE capabilities to test and evaluate Manned Unmanned Teaming, combat scenarios or other emerging program needs. RD funding will utilize the M&S environment to mature and evaluate S&T for inclusion to program requirements, Engineering Change Proposals (ECPs) and/or technical insertions and various mission payload development, utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and CONOPS and continue validating simulation scenarios to expand test capability. Funding will support Rapid prototyping to inform emerging programs with a Buy, Try, Decide strategy. In addition, funds support the exploration and development of Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV) and 915 truck fleets) beyond the PLS and providing an autonomous capability to existing Army vehicles. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Minimal increase from FY 2020 to FY 2021 due to inflation.	1.574	2.912	3.060
Title: Tactical Wheeled Vehicle - Leader Follower - Combat Capabilities Development Command Ground Vehicle Systems Center (CCDC GVSC) Tech Demo ***Description:*** Tactical Wheeled Vehicle - Leader Follower (TWV-LF) provides a limited autonomous vehicle software and applique kit to 10 ALUGS test Palletized Load System (PLS) A1s. For the CCDC GVSC Tech Demo, the applique kit provides a designated	42.302	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
manned Leader vehicle which leads a line of 3 optionally manned Follower vehicles. The Leader vehicle wirelessly provides directional and speed guidance to the Follower vehicles to follow the Leader vehicle with no driver input or unmanned. The primary purposes for Leader Follower is to improve Force Protection and increase logistics throughput. Funding allows the Army to demonstrate and operationally assess an unmanned vehicle capability with operational units and users to validate the technology. The Army will build, and test prototype systems for safety release, Soldier use, and further technology maturation.			
Title: Robotic Combat Vehicle ? Experimental Unit Prototypes - Combat Capabilities Development Command Ground Vehicle Systems Center (CCDC GVSC) ***Description:*** Robotic Combat Vehicle (RCV) Experimental Unit Prototyping effort will produce unmanned combat vehicle prototypes with the purpose of creating an experimental unit that Soldiers will use to create new Concepts of Operations (CONOPS), and new requirements for unmanned combat vehicles to support Army Modernization priorities. Effort will leverage a three phase approach to promote multiple industry partners to provide innovative, armed unmanned platforms for soldier experimentation with the intent of defining requirements for future RCV program of record. The first two phases will focus on surrogate RCV platforms to get armed unmanned systems into Soldier?s hands for experimentation as quickly as possible. Phase 1 delivers a platoon set of modified M113s with remote weapons stations in order to start to define how an RCV can augment combat capability and to help refine requirements based on user feedback for a follow-on purpose built RCV effort which will start in Phase 3. Phase 2 adds an additional two platoons of surrogate RCVs to enable soldiers to execute company level maneuvers to better understand how RCVs will be used in the future fight and to refine software behaviors and control strategies of the RCVs.. Lessons learned from the phase 1 soldier experimentation will directly shape the requirements for the Phase 3 purpose built RCV effort which will competitively deliver up to a company set of RCVs through at least 2 industry partners for an extended Soldier evaluation. CONOPs and TTPS developed under Phase 2 will inform extended operations experiment in phase 3 and ultimately form the basis for a decision point to move forward with a procurement of RCVs.	18.540	-	-
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun (CCDC GVSC) ***Description:*** FY 2018 NDAA SEC 825 MDAP Cost Overrun (CCDC GVSC)	0.028	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:***	-	0.139	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC 638			
Accomplishments/Planned Programs Subtotals	67.868	3.051	3.060

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Pre-acquisition program activities funded by this line transition to a separate Program Element and Project prior to their first program acquisition Milestone (B or C).

D. Acquisition Strategy

Robotics Development (RD) is designed to facilitate the transition of robotics and autonomous systems technology from Science and Technology (S&T) projects into emerging programs of record. It informs the acquisition process early in the development cycle allowing key stakeholders the ability to make integration decisions and affordability trades while writing requirements.

Product Manager Applique and Large Unmanned Ground Systems (PdM ALUGS) builds upon the CCDC GVSC Expedient Leader Follower (ExLF) Operational Technology Demonstration (OTD) to provide a limited autonomous vehicle capability to Tactical Wheeled Vehicles including the Palletized Load System (PLS) A1, Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicle (FMTV). Efforts include Capabilities Document input, close analysis of OTD activities that feed cost estimates, capture technical and test data, provide test support, develop Modeling and Simulation (M&S) capabilities, and develop a Software Integration Lab (SIL). Efforts may support Rapid prototyping to inform emerging programs and other Army systems. A "buy/lease, try and inform" methodology may be used to evaluate Commercial Off the Shelf (COTS), Government Off the Shelf (GOTS) and Non-Developmental Item (NDI) robotics products that have the potential to enhance Soldier combat effectiveness. Actual operational user feedback and evaluation results obtained will inform emerging capabilities and requirements documents in support of a return on investment to support future Army decision making.

Robotic Combat Vehicle (RCV) funding supports Systems Engineering, Requirements, Cost Analysis, Joint Capabilities Technology Demonstration (JCTD) support, and technology transition plans.

Combat Capabilities Development Command (CCDC) Ground Vehicle Systems Center (GVSC) funding allows the Army to demonstrate and operationally assess an unmanned vehicle capability with operational units and users to validate the technology. The Army will build, and test prototype systems for safety release, Soldier use, and further technology maturation.

Robotic Combat Vehicle (RCV) Experimental Unit Prototyping will provide unmanned combat vehicles to enable users to assess the capability of the platforms and created new CONOPS and doctrine for manned/unmanned teaming based operations. Efforts will inform new CONOPS, identified system limitations and benefits and provide an achievable, analytically backed basis for future RCV requirements documents to drive future acquisition programs.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PM FP PdM ALUGS	Allot	PM FP : Warren, MI	2.350	1.025	Nov 2018	0.454	Oct 2019	0.500	Oct 2019	-		0.500	0.000	4.329	-
FY 2018 NDAA SEC 825 MDAP Cost Overrun	TBD	N/A : N/A	-	0.028		-		-		-		-	0.000	0.028	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.139		-		-		-	0.000	0.139	-
		Subtotal	2.350	1.053		0.593		0.500		-		0.500	0.000	4.496	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RCV/ACO M&S SIL ALUGS	MIPR	CCDC GVSC : Warren, MI	-	1.100	Dec 2018	-		-		-		-	0.000	1.100	-
SMET Modular Mission Payloads ALUGS	TBD	TBD : TBD	-	1.000	Dec 2018	-		-		-		-	0.000	1.000	-
Leader Follower (CCDC GVSC) Tech Demo A Kit	C/CPFF	Robotic Research : Baltimore, MD	10.400	15.544	Oct 2018	-		-		-		-	0.000	25.944	-
Leader Follower (CCDC GVSC) Tech Demo B Kit	C/CPFF	Oshkosh : Oshkosh, WI	9.402	12.021	Dec 2018	-		-		-		-	0.000	21.423	-
Leader Follower (CCDC GVSC) Integrated System Integrator	C/CPFF	Lockheed Martin : Dallas, TX	4.500	3.199	Oct 2018	-		-		-		-	0.000	7.699	-
Leader Follower (CCDC GVSC) Warfighter Machine Interface	C/CPFF	DCS Corp : Boston, MA	2.500	4.477	Nov 2018	-		-		-		-	0.000	6.977	-
RCV Risk Reduction Platform Development (CCDC GVSC)	C/CPFF	To Be Determined : To Be Determined	-	18.540	Nov 2018	-		-		-		-	0.000	18.540	-
RD M&S SIL ALUGS	MIPR	CCDC GVSC and various : Warren, MI	-	-		1.494	Oct 2019	1.160	Oct 2019	-		1.160	0.000	2.654	-
		Subtotal	26.802	55.881		1.494		1.160		-		1.160	0.000	85.337	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PdM ALUGS Support	MIPR	Various : Multiple locations	4.109	3.173	Oct 2018	0.964	Oct 2019	1.000	Oct 2019	-		1.000	0.000	9.246	-
SMET Modular Mission Payloads ALUGS	MIPR	PdM ALUGS : Warren, MI	-	0.550	Oct 2018	-		-		-		-	0.000	0.550	-
Technology Demo support (CCDC GVSC)	MIPR	CCDC GVSC : Warren, MI	1.000	1.978	Oct 2018	-		-		-		-	0.000	2.978	-
		Subtotal	5.109	5.701		0.964		1.000		-		1.000	0.000	12.774	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Leader Follower (CCDC GVSC) Tech Demo Testing	MIPR	ATEC : Aberdeen, MD	0.500	0.200	Oct 2018	-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Tech Demo Data Logger	MIPR	ATEC : Aberdeen, MD	0.500	0.200	Oct 2018	-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Testing	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	-	3.933	Dec 2018	-		-		-		-	0.000	3.933	-
Leader Follower (CCDC GVSC) Data Logger	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	-	0.750	Dec 2018	-		-		-		-	0.000	0.750	-
PdM ALUGS RD ATEC support	MIPR	ATEC : Aberdeen, MD	-	0.150	Nov 2018	-		0.400	Nov 2020	-		0.400	0.000	0.550	-
		Subtotal	1.000	5.233		-		0.400		-		0.400	0.000	6.633	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	35.261	67.868		3.051		3.060		-		3.060	0.000	109.240	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

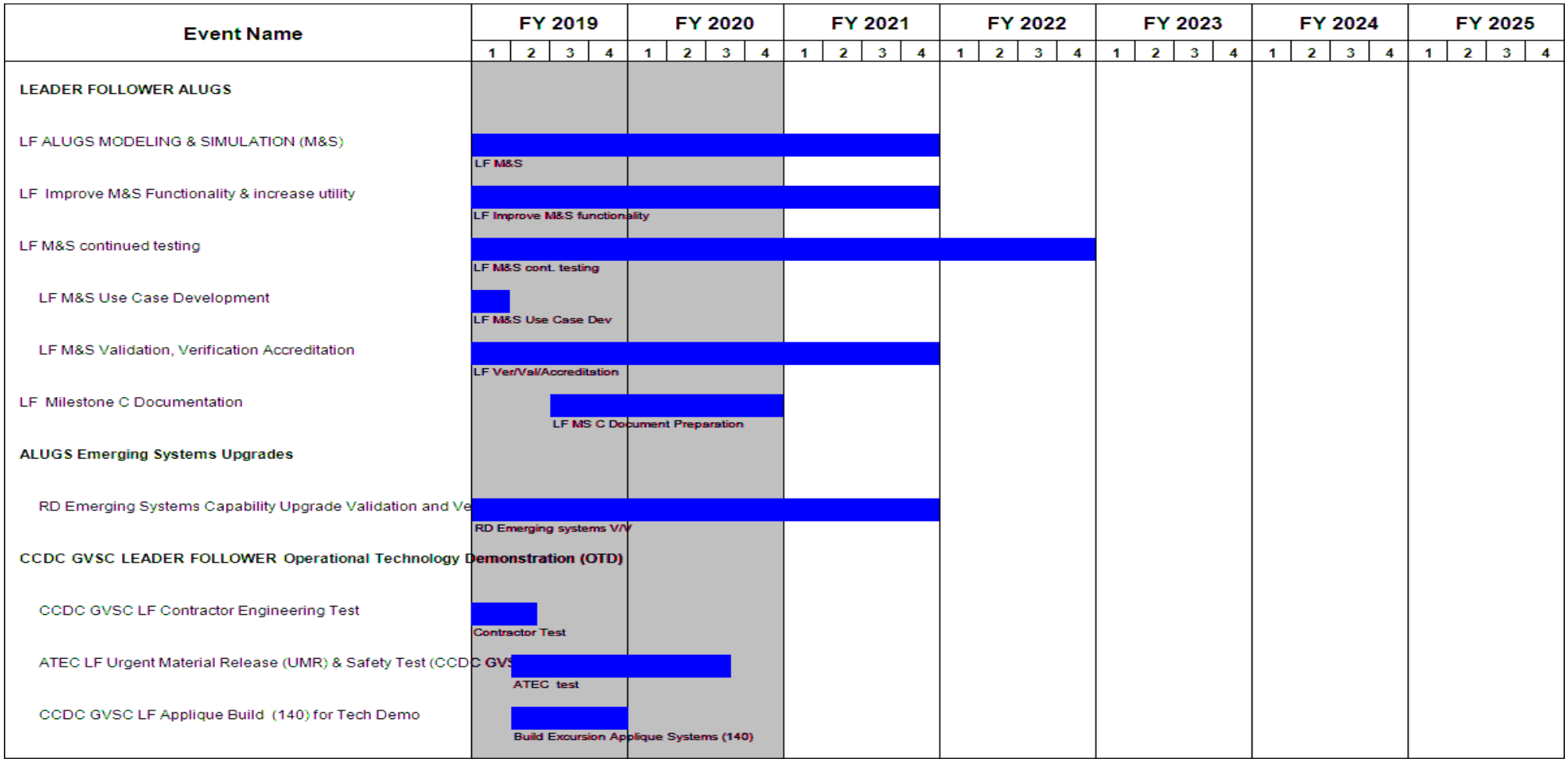

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

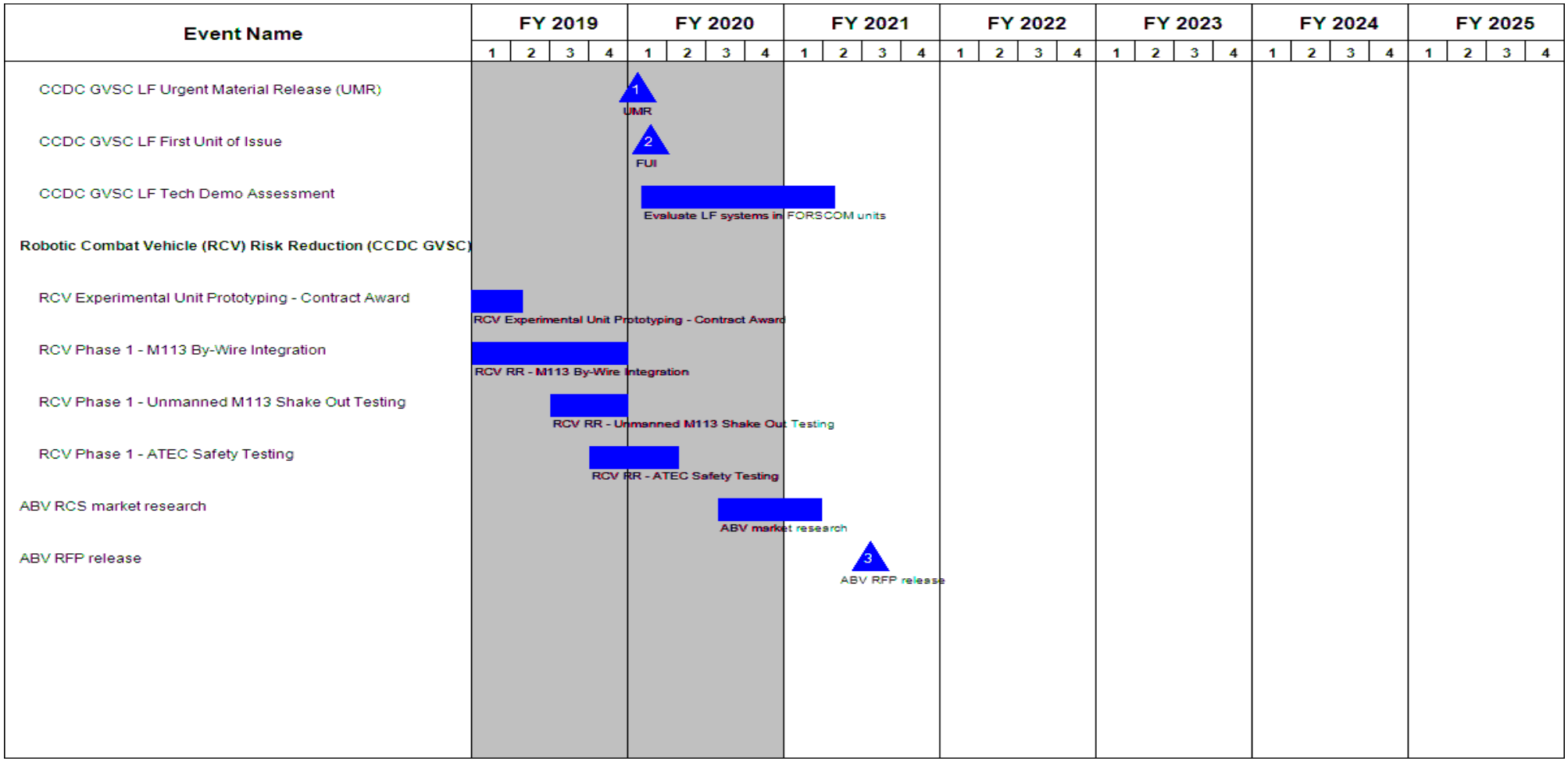

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
LEADER FOLLOWER ALUGS	1	2017	4	2022
LF ALUGS MODELING & SIMULATION (M&S)	1	2017	4	2021
LF M&S Data Source Matrix Development	1	2017	4	2017
LF M&S Initial Capability Development	4	2017	2	2018
LF Improve M&S Functionality & increase utility	3	2018	4	2021
LF M&S continued testing	2	2018	4	2022
LF M&S Use Case Development	1	2018	1	2019
LF M&S Validation, Verification Accreditation	4	2018	4	2021
LF Milestone C Documentation	3	2019	4	2020
ALUGS Emerging Systems Upgrades	1	2017	4	2022
RD Emerging Systems Capability Upgrade Validation and Verification	1	2019	4	2021
CCDC GVSC LEADER FOLLOWER Operational Technology Demonstration (OTD)	3	2018	3	2022
CCDC GVSC LF Applique Prototype Build (10) for test	3	2018	4	2018
CCDC GVSC LF Order Items for 140 Applique Systems	3	2018	4	2018
CCDC GVSC LF Contractor Engineering Test	3	2018	2	2019
ATEC LF Urgent Material Release (UMR) & Safety Test (CCDC GVSC)	2	2019	3	2020
CCDC GVSC LF Applique Build (140) for Tech Demo	2	2019	4	2019
CCDC GVSC LF Urgent Material Release (UMR)	1	2020	1	2020
CCDC GVSC LF First Unit of Issue	1	2020	1	2020
CCDC GVSC LF Tech Demo Assessment	1	2020	2	2021
Robotic Combat Vehicle (RCV) Risk Reduction (CCDC GVSC)	4	2019	4	2021
RCV Experimental Unit Prototyping - Contract Award	1	2019	1	2019
RCV Phase 1 - M113 By-Wire Integration	1	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
RCV Phase 1 - Unmanned M113 Shake Out Testing	3	2019	4	2019
RCV Phase 1 - ATEC Safety Testing	4	2019	2	2020
ABV RCS market research	3	2020	1	2021
ABV RFP release	3	2021	3	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604020A *I Cross Functional Team (CFT) Advanced Development & Prototyping*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	8.225	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	8.225
CF1: *CFT Advanced Development & Prototyping*	-	8.225	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	8.225

Note

This program was a FY 2019 new start. FY 2020 and out funding supporting CFT Network efforts has been realigned to 0604541A Unified Network Transport.

A. Mission Description and Budget Item Justification

This Program Element (PE) funds experimental prototyping and technical demonstrations of selected technologies conducted by Cross-Functional Teams (CFT) in order to inform and refine the development of initial capability documents in support of Long Range Precision Fires (LRPF), Next Generation Combat Vehicle (NGCV), Future Vertical Lift (FVL), Network Command, Control Communication, and Intelligence (NC3I), Assured Positioning, Navigation, and Timing (APNT), Air and Missile Defense (AMD), Soldier Lethality, and Synthetic Training Environment (STE). Funding facilitates the experimentation and demonstration of priority technologies to ensure that planned capabilities are technologically feasible, affordable, and available to Soldiers. Benefits include the narrowing of capability gaps by developing capability documents and rapidly transitioning leader-approved capability requirements to the Army Acquisition System. In project CF1, CFT will conduct pre-Materiel Solution Analysis Phase experimentation and technical demonstrations to enable capability document development and improve the decision making for potential programs of record.

This investment supports the Chief of Staff of the Army (CSA) six modernization priorities.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	9.488	0.000	0.000	-	0.000
Current President's Budget	8.225	0.000	0.000	-	0.000
Total Adjustments	-1.263	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.263	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*	Project (Number/Name) CF1 / *CFT Advanced Development & Prototyping*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
CF1: *CFT Advanced Development & Prototyping*	-	8.225	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	8.225
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project was a new start in FY 2019.

A. Mission Description and Budget Item Justification

This project funds pre-Materiel Solution Analysis Phase experimentation and technical demonstrations conducted by the eight Cross-Functional Teams (CFT) to inform and refine the development of Initial Capability Documents (ICD) to support Materiel Development Decision (MDD) in the areas of Long Range Precision Fires (LRPF), Next Generation Combat Vehicle (NGCV), Future Vertical Lift (FVL), Network Command, Control Communication, and Intelligence (NC3I), Assured Positioning, Navigation, and Timing (APNT), Air and Missile Defense (AMD), Soldier Lethality, and Synthetic Training Environment (STE). CFT advanced development and prototyping efforts will narrow an existing capability gap by informing capability document development and rapidly transition leader-approved capability requirements to the Army Acquisition System. This will allow for faster development of capabilities and ensure planned capabilities are technologically feasible, affordable, and available to the Soldier.

This investment support the Chief of Staff of the Army (CSA) six modernization priorities

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: CFT Experimental prototyping and technology Demonstration	8.225	-	-
Description: Cross-Functional Teams (CFT) conduct experimental prototyping and technical demonstrations) in order to inform and refine the development of initial capability documents in support of Long Range Precision Fires (LRPF), Next Generation Combat Vehicle (NGCV), Future Vertical Lift (FVL), Network Command, Control Communication, and Intelligence (NC3I), Assured Positioning, Navigation, and Timing (APNT), Air and Missile Defense (AMD), Soldier Lethality, and Synthetic Training Environment (STE).			
Accomplishments/Planned Programs Subtotals	8.225	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*	**Project (Number/Name)** CF1 / *CFT Advanced Development & Prototyping*

C. Other Program Funding Summary ($ in Millions)

Remarks

Transition of technologies are aligned with multiple RDT&E or Procurement lines, to include but not limited to:

OPA: Signal Modernization B00010; Net Warrior R80501; Tactical Network Radio System Handheld B95006; Manpack B95007; COTS Tactical Radio B98105.
RDT&E: Command Post Computing Environment 654818323

D. Acquisition Strategy

Activities will be conducted both in-house and through multiple competitively-awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*	Project (Number/Name) CF1 / *CFT Advanced Development & Prototyping*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CFT Experimental Prototyping and technology demonstrations	Various	CACI : Washington DC	-	3.525		-		-		-		-	0.000	3.525	-
E31 Exploit Enhance Enable and Influence	Various	GSA FEDSIM/ CACI : Washington D.C.	-	3.700	May 2019	-		-		-		-	0.000	3.700	-
		Subtotal	-	7.225		-		-		-		-	0.000	7.225	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SETA	TBD	Perspecta : APG Maryland	-	1.000	May 2019	-		-		-		-	0.000	1.000	-
		Subtotal	-	1.000		-		-		-		-	0.000	1.000	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	8.225		0.000		-		-		-	0.000	8.225	N/A

Remarks

Contracting will be conducted through Other Transactional Agreements or through FAR Part 12 Commercial Acquisition.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*	**Project (Number/Name)** CF1 / *CFT Advanced Development & Prototyping*

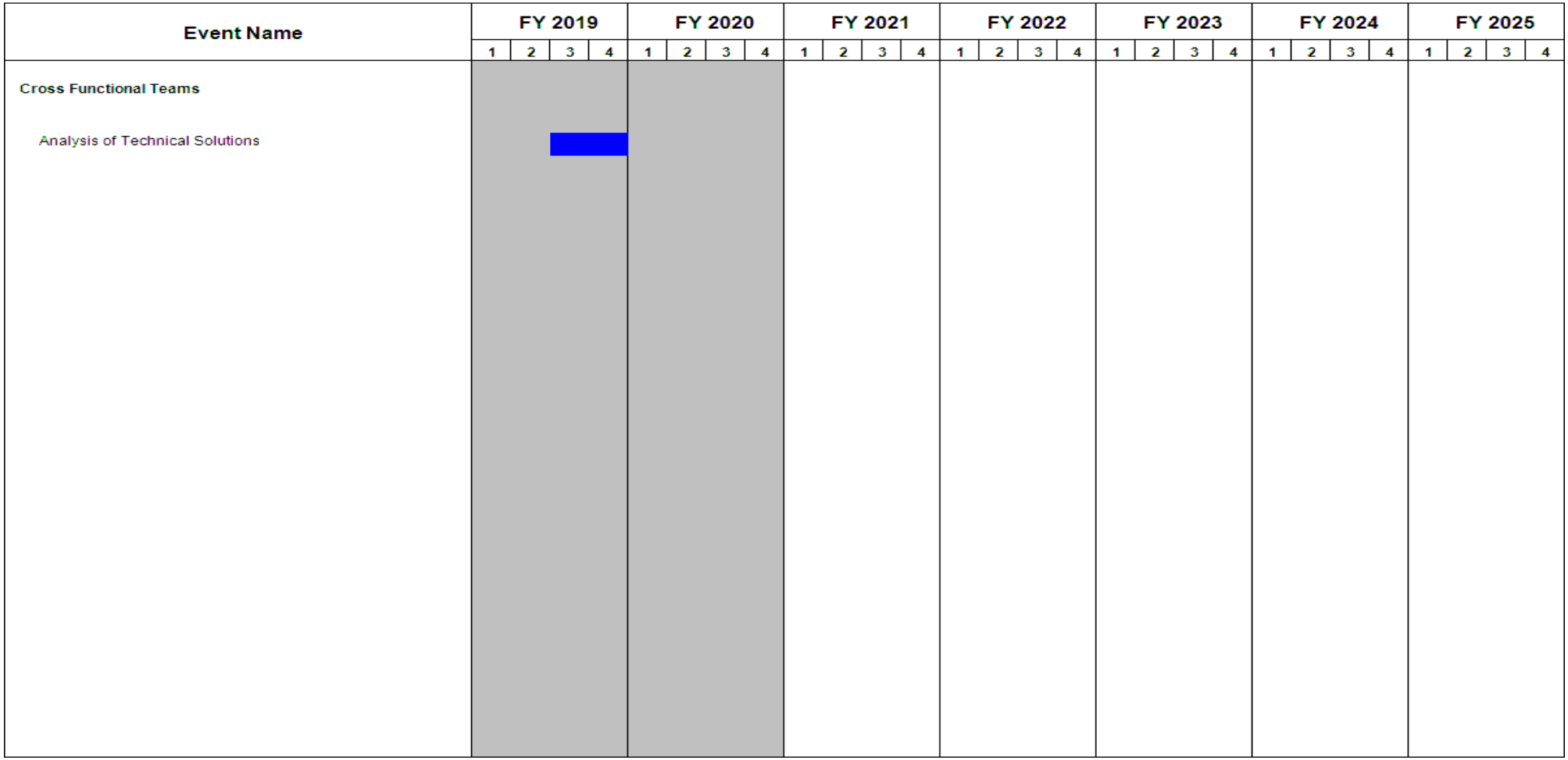

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*	**Project (Number/Name)** CF1 / *CFT Advanced Development & Prototyping*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Cross Functional Teams	3	2019	1	2021
Analysis of Technical Solutions	3	2019	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604021A *I Electronic Warfare Technology Maturation (MIP)*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	23.043	22.840	-	22.840	0.000	0.000	0.000	0.000	0.000	45.883
AW7: *Electronic Warfare Technology Maturation (MIP)*	-	0.000	23.043	22.840	-	22.840	0.000	0.000	0.000	0.000	0.000	45.883

A. Mission Description and Budget Item Justification

Terrestrial Layer System (TLS) provides Army maneuver forces integrated full spectrum Signals Intelligence (SIGINT), Electronic Warfare (EW), and Cyber-enabling non-kinetic offensive operation options to Brigade Combat Team (BCT) and Expeditionary-Military Intelligence Brigade (EMIB) commanders. TLS' information superiority provides Indications and Warnings, Force Protection and Situational Awareness to influence the commander's decision cycle, improve targeting timeliness and accuracy, and provide the maneuver commander with electronic attack and offensive cyber warfare options to deny, degrade, disrupt, or otherwise manipulate the targeted force. TLS employs technologically advanced systems with a modular open-system approach for multiple operation configurations that can be efficiently sustained and effectively upgraded to provide capabilities against changing near peer and emerging threats to address multi-domain capability gaps.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	18.043	18.800	-	18.800
Current President's Budget	0.000	23.043	22.840	-	22.840
Total Adjustments	0.000	5.000	4.040	-	4.040
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	4.040	-	4.040

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: AW7: *Electronic Warfare Technology Maturation (MIP)*		
Congressional Add: *Counter drone RF-signal based targeting*	-	5.000
Congressional Add Subtotals for Project: AW7	-	5.000
Congressional Add Totals for all Projects	-	5.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604021A *I Electronic Warfare Technology Maturation (MIP)*

Change Summary Explanation

Additional $4.040 million required in FY 2021 to continue TLS development activities.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	Project (Number/Name) AW7 / *Electronic Warfare Technology Maturation (MIP)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AW7: *Electronic Warfare Technology Maturation (MIP)*	-	0.000	23.043	22.840	-	22.840	0.000	0.000	0.000	0.000	0.000	45.883
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Terrestrial Layer System (TLS) provides Army maneuver forces integrated full spectrum Signals Intelligence (SIGINT), Electronic Warfare (EW), and Cyber-enabling non-kinetic offensive operation options to Brigade Combat Team (BCT) and Expeditionary-Military Intelligence Brigade (EMIB) commanders. TLS' information superiority provides Indications and Warnings, Force Protection and Situational Awareness to influence the commander's decision cycle, improve targeting timeliness and accuracy, and provide the maneuver commander with electronic attack and offensive cyber warfare options to deny, degrade, disrupt, or otherwise manipulate the targeted force. TLS employs technologically advanced systems with a modular open-system approach for multiple operation configurations that can be efficiently sustained and effectively upgraded to provide capabilities against changing near peer and emerging threats to address multi-domain capability gaps.

Justification:
FY 2021 Base funding in the amount of $22.840 million provides for, but is not limited to, the development and evaluation of component level TLS technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technical / Program Management	-	2.282	2.282
Description: Funds will provide for technical engineering and program management. ***FY 2020 Plans:*** FY 2020 technical engineering and program management support for TLS. ***FY 2021 Plans:*** FY 2021 technical engineering and program management support for TLS.			
Title: Systems Engineering and Component Prototyping	-	15.761	20.558
Description: Funds will provide for, but are not limited to development, engineering and evaluation of component level technologies to include antennas, radios, software architecture and other Signals Intelligence (SIGINT), Electronic Warfare Support (ES), Electronic Attack (EA) and Cyber enabling components to mature technical feasibility and reduce Critical Technology Element (CTE) risks. Funds will support, but are not limited to the development capabilities to enhance and integrate Signals of Interest, develop system level designs, reduce Size, Weight and Power (SWaP), to mature components into an emerging Program of Record (PoR) level technology maturation level, and to support the evaluation environment to conduct required developmental events.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Conduct development of SIGINT, ES, EA and cyber enabling components and system alternatives. Award contract agreements to mature critical technologies, develop sub-systems, components and reduce component integration risks in a System solution that can be evaluated for affordability, feasibility, and technical maturity; all of which will reduce program technical and cost risks. ***FY 2021 Plans:*** Continue development of SIGINT, ES, EA and cyber enabling components and system alternatives. Continue to mature and evaluate critical technologies, co-develop Intelligence Community (IC) Signals of Interest (SOI), develop sub-systems, components and reduce component integration risks in a system solution that can be evaluated for affordability, feasibility, and technical maturity; all of which will reduce program technical and cost risks. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increased funding in FY 2021 due to multiple evaluation requirements.			
Accomplishments/Planned Programs Subtotals	-	18.043	22.840

	FY 2019	FY 2020
Congressional Add: Counter drone RF-signal based targeting	-	5.000
FY 2020 Plans: Counter drone RF-signal based targeting		
Congressional Adds Subtotals	-	5.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• FJ5: *Terrestrial Layer System (MIP)*	-	-	38.105	-	38.105	51.250	20.980	12.090	-	0.000	122.425
• B97610: *TERRESTRIAL LAYER SYSTEM (TLS) (MIP)*	-	-	8.081	-	8.081	39.710	88.133	167.066	186.448	0.000	489.438

Remarks

D. Acquisition Strategy

A competitive acquisition approach for component development and prototyping is planned for TLS using a tailored acquisition strategy to rapidly deliver an initial integrated signals intelligence, electronic warfare and cyber capability to the Army. These efforts will be used, but are not limited to identify, develop, prototype, evaluate, analyze, and demonstrate potential capabilities and alternative solutions. These efforts will quantify the respective maturity and effectiveness to mitigate capability gaps

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

against changing near peer representative enemy target sets and operational scenarios. Enhanced capability and other technologies to provide overmatch capabilities will be evaluated for merit and will provide increased performance for production of TLS systems in FY 2022.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering and Prototyping	C/Various	TBD : TBD	-	-		15.761	Feb 2020	20.558	Feb 2021	-		20.558	0.000	36.319	-
Counter drone RF-signal based targeting	C/Various	TBD : TBD	-	-		5.000		-		-		-	0.000	5.000	-
		Subtotal	-	-		20.761		20.558		-		20.558	0.000	41.319	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical / Program Management	C/CPFF	AASKI Technology : Tinton Falls, NJ	-	-		1.141	Nov 2019	1.141	Nov 2020	-		1.141	0.000	2.282	-
Technical / Program Management	MIPR	Various Matrix Support Organizations : Abderdeen Proving Grounds, MD	-	-		1.141	Nov 2019	1.141	Nov 2020	-		1.141	0.000	2.282	-
		Subtotal	-	-		2.282		2.282		-		2.282	0.000	4.564	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		23.043		22.840		-		22.840	0.000	45.883	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

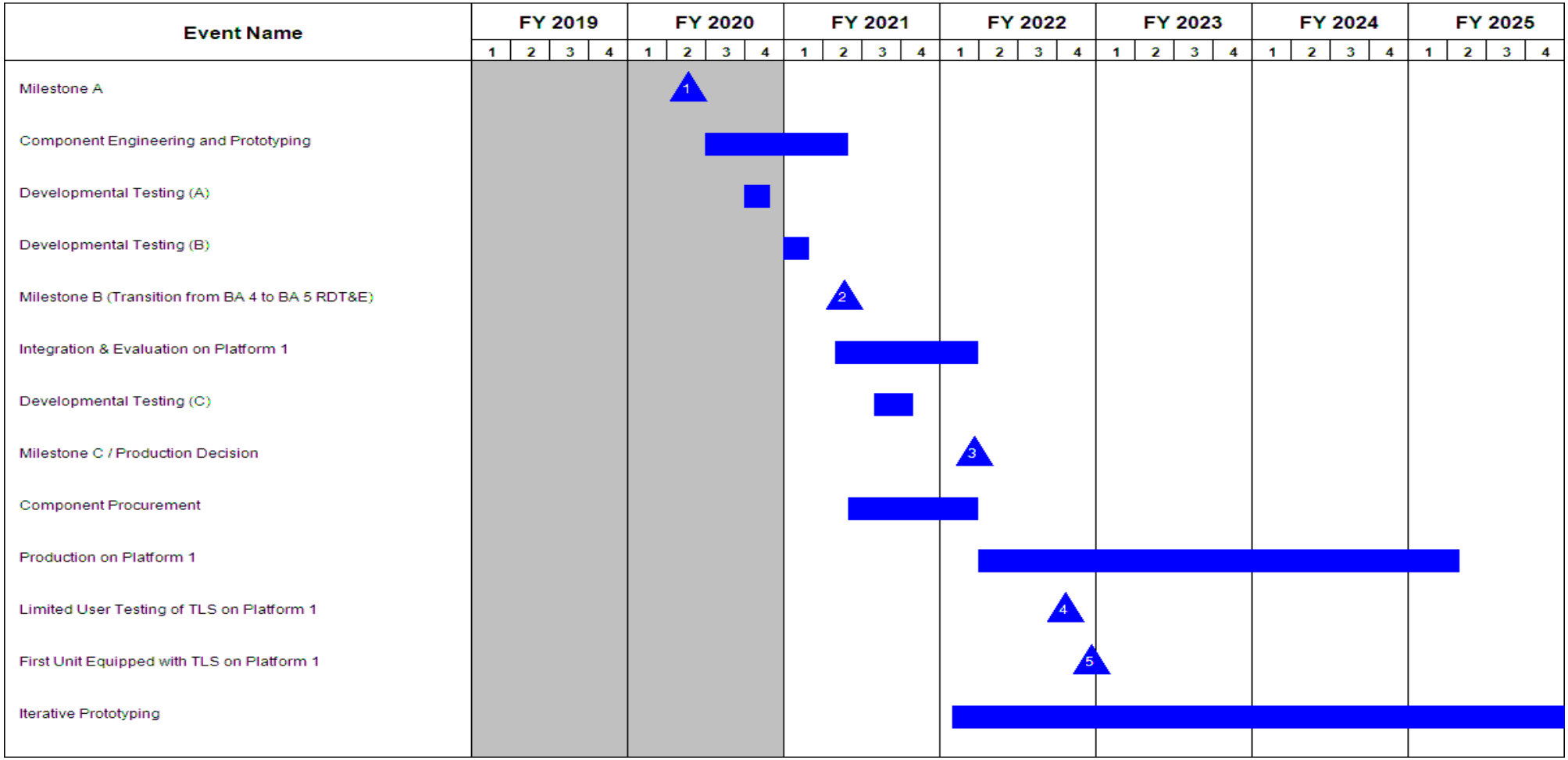

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

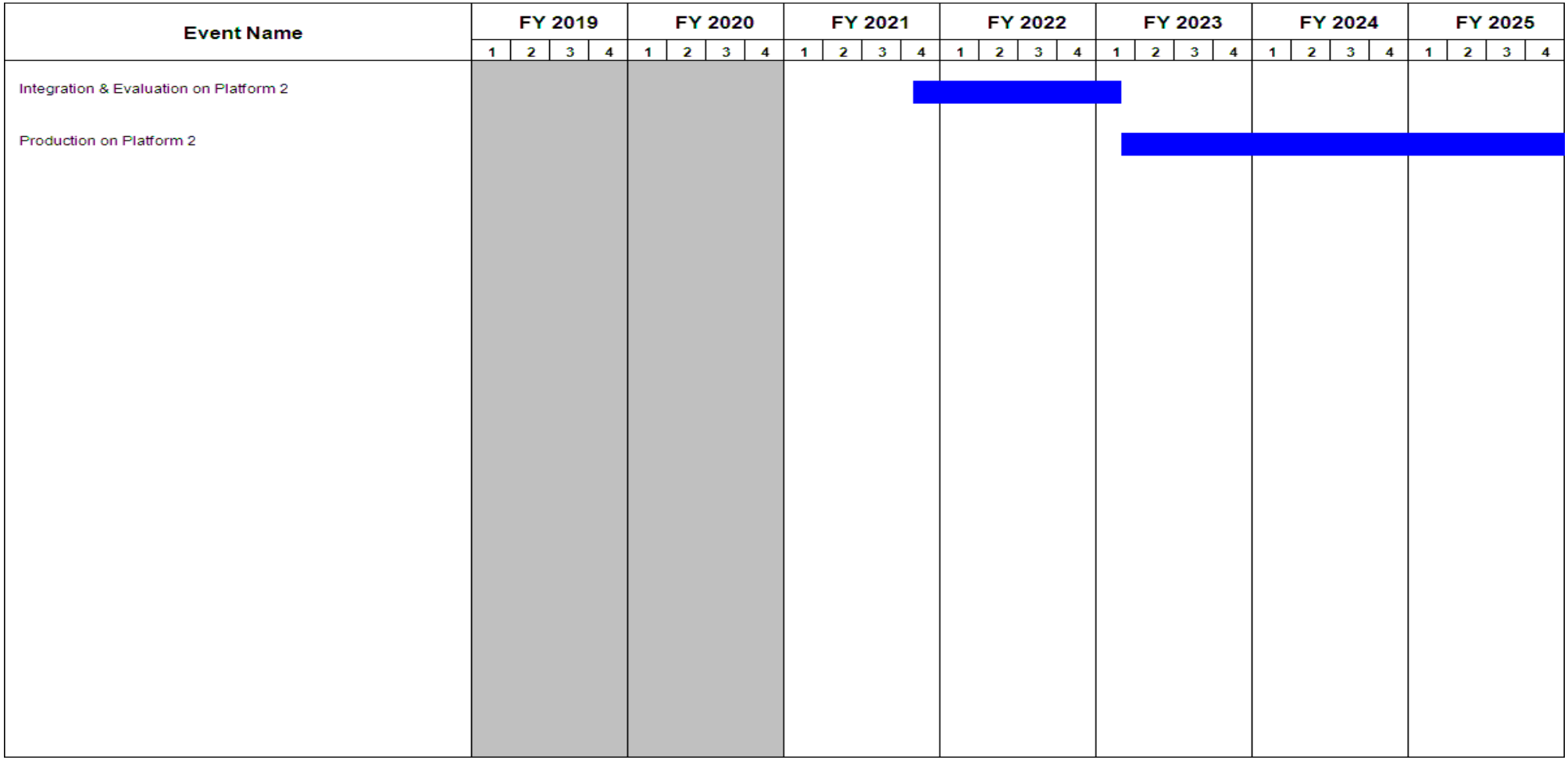

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604021A / *Electronic Warfare Technology Maturation (MIP)*	**Project (Number/Name)** AW7 / *Electronic Warfare Technology Maturation (MIP)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Milestone A	2	2020	2	2020
Component Engineering and Prototyping	3	2020	2	2021
Developmental Testing (A)	4	2020	4	2020
Developmental Testing (B)	1	2021	1	2021
Milestone B (Transition from BA 4 to BA 5 RDT&E)	2	2021	2	2021
Integration & Evaluation on Platform 1	2	2021	1	2022
Developmental Testing (C)	3	2021	4	2021
Milestone C / Production Decision	1	2022	1	2022
Component Procurement	2	2021	1	2022
Production on Platform 1	2	2022	2	2025
Limited User Testing of TLS on Platform 1	4	2022	4	2022
First Unit Equipped with TLS on Platform 1	4	2022	4	2022
Iterative Prototyping	1	2022	1	2027
Integration & Evaluation on Platform 2	4	2021	1	2023
Production on Platform 2	1	2023	1	2027

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604035A *I Low Earth Orbit (LEO) Satellite Capability*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	22.678	-	22.678	19.881	18.084	27.175	15.986	0.000	103.804
BX7: *Low Earth Orbit (LEO) Satellite Capability*	-	0.000	0.000	22.678	-	22.678	19.881	18.084	27.175	15.986	0.000	103.804

A. Mission Description and Budget Item Justification

The US Army Tactical Space Strategy provides Tactical Land Component Forces with space capabilities required to enable force projection and maneuver during Multi-Domain Operations. US Army space-based sensors will integrate with commercial and national systems to provides resilient communications, assured PNT and deep sensing capabilities required in the targeting process to enable rapid and responsive sensor-to-shooter applications required to engage and defeat Anti-Access/Area Denial (A2/AD) forces and enable force projection and maneuver in contested Multi-Domain Operations

The LEO Satellite Capability will provide prototyping, development and experimentation of the Tactical Space Layer (TSL) sensors 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. Follow-on persistent prototype tactical sensor capabilities will be operational in FY 2021/2022 and will be integrated with the Army Tactical Intelligence Targeting Access Node (TITAN) ground station to tactically task, receive and disseminate data to directly support live-fire S2S demonstrations and assessments.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy. Work in this Project complements and is fully coordinated with PE 633463 (Tag, Track and Locate). The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command in Huntsville, AL. FY 2020 realignments are due to financial restructuring in support of Army Modernization Priorities.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	22.678	-	22.678
Total Adjustments	0.000	0.000	22.678	-	22.678
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	22.678	-	22.678

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	Project (Number/Name) BX7 / *Low Earth Orbit (LEO) Satellite Capability*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BX7: *Low Earth Orbit (LEO) Satellite Capability*	-	0.000	0.000	22.678	-	22.678	19.881	18.084	27.175	15.986	0.000	103.804
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2021, Project BX7 Low Earth Orbit (LEO) Satellite Capability transitioned from Program Element (PE) 1206308A, Project FE5 Space And Missile Defense Integration.

A. Mission Description and Budget Item Justification

The US Army Tactical Space Strategy provides Tactical Land Component Forces with space capabilities required to enable force projection and maneuver during Multi-Domain Operations. US Army space-based sensors will integrate with commercial and national systems to provides resilient communications, assured PNT and deep sensing capabilities required in the targeting process to enable rapid and responsive sensor-to-shooter applications required to engage and defeat Anti-Access/Area Denial (A2/AD) forces and enable force projection and maneuver in contested Multi-Domain Operations

The LEO Satellite Capability will provide prototyping, development and experimentation of the Tactical Space Layer (TSL) sensors 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. Follow-on persistent prototype tactical sensor capabilities will be operational in FY 2021/2022 and will be integrated with the Army Tactical Intelligence Targeting Access Node (TITAN) ground station to tactically task, receive and disseminate data to directly support live-fire S2S demonstrations and assessments.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: LEO Satellite Capability	-	-	17.678
Description: A dedicated constellation of small satellites to provide resilient, persistent LEO capability to address shortfalls in current reconnaissance, surveillance, and target acquisition (RSTA) and PNT systems. Provides the ability to identify and locate targets of interest in denied and contested environments actionable to the tactical warfighter. This includes the Battle Management, Command and Communication (BMC2) capability required to task payloads and fuse data, as well as algorithms to enhance, analyze, and disseminate this data to the tactical warfighter via existing Army systems and networks in support of Sensor-to-Shooter demonstrations directly supporting Long Range Precision Fires (LRPF).			
FY 2021 Plans: LEO Satellite Capability			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	**Project (Number/Name)** BX7 / *Low Earth Orbit (LEO) Satellite Capability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Begin validation of demonstration constellation in a realistic operational environment. Evaluate the integrated RSTA, PNT, BMC2, and communications technologies to identify and locate targets of interest in denied and contested environments actionable to the tactical warfighter. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy. Work in this Project complements and is fully coordinated with PE 633463 (Tag, Track and Locate). The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command in Huntsville, AL. FY 2020 realignments are due to financial restructuring in support of Army Modernization Priorities.			
Title: APNT Integrated Space Communications ***Description:*** Development of a unique advanced space communications capability to explore advanced ground based space communications technologies and concepts utilizing bi-static Radio Frequency (RF) scattering and propagation with precision frequency, phase, and power management. This space communications capability will develop and demonstrate multiple advanced Army LEO space communications concepts and will also assess interfacing with multiple Joint Service space communication missions ***FY 2021 Plans:*** Assess performance of space communications capabilities of multiple advanced Army LEO space communications concepts and interfacing with multiple Joint Services. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy. Work in this Project complements and is fully coordinated with PE 633463 (Tag, Track and Locate). The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command in Huntsville, AL. FY 2020 realignments are due to financial restructuring in support of Army Modernization Priorities.	-	-	5.000
Accomplishments/Planned Programs Subtotals	-	-	22.678

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	**Project (Number/Name)** BX7 / *Low Earth Orbit (LEO) Satellite Capability*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	**Project (Number/Name)** BX7 / *Low Earth Orbit (LEO) Satellite Capability*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Gov/SETA Support LEO	TBD	Multiple : Multiple Locations	-	-		-		3.000	Oct 2020	-		3.000	0.000	3.000	Continuing
Matrix Gov/SETA Support APNT Integrated Space Communications	TBD	Multiple : Multiple Locations	-	-		-		1.000	Oct 2020	-		1.000	0.000	1.000	Continuing
		Subtotal	-	-		-		4.000		-		4.000	0.000	4.000	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LEO Satellite Capability	Various	Multiple : Multiple	-	-		-		14.678	Feb 2021	-		14.678	0.000	14.678	Continuing
APNT Integrated Space Communications	MIPR	Classified : Classified	-	-		-		4.000	Jan 2021	-		4.000	0.000	4.000	Continuing
		Subtotal	-	-		-		18.678		-		18.678	0.000	18.678	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		22.678		-		22.678	0.000	22.678	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	**Project (Number/Name)** BX7 / *Low Earth Orbit (LEO) Satellite Capability*

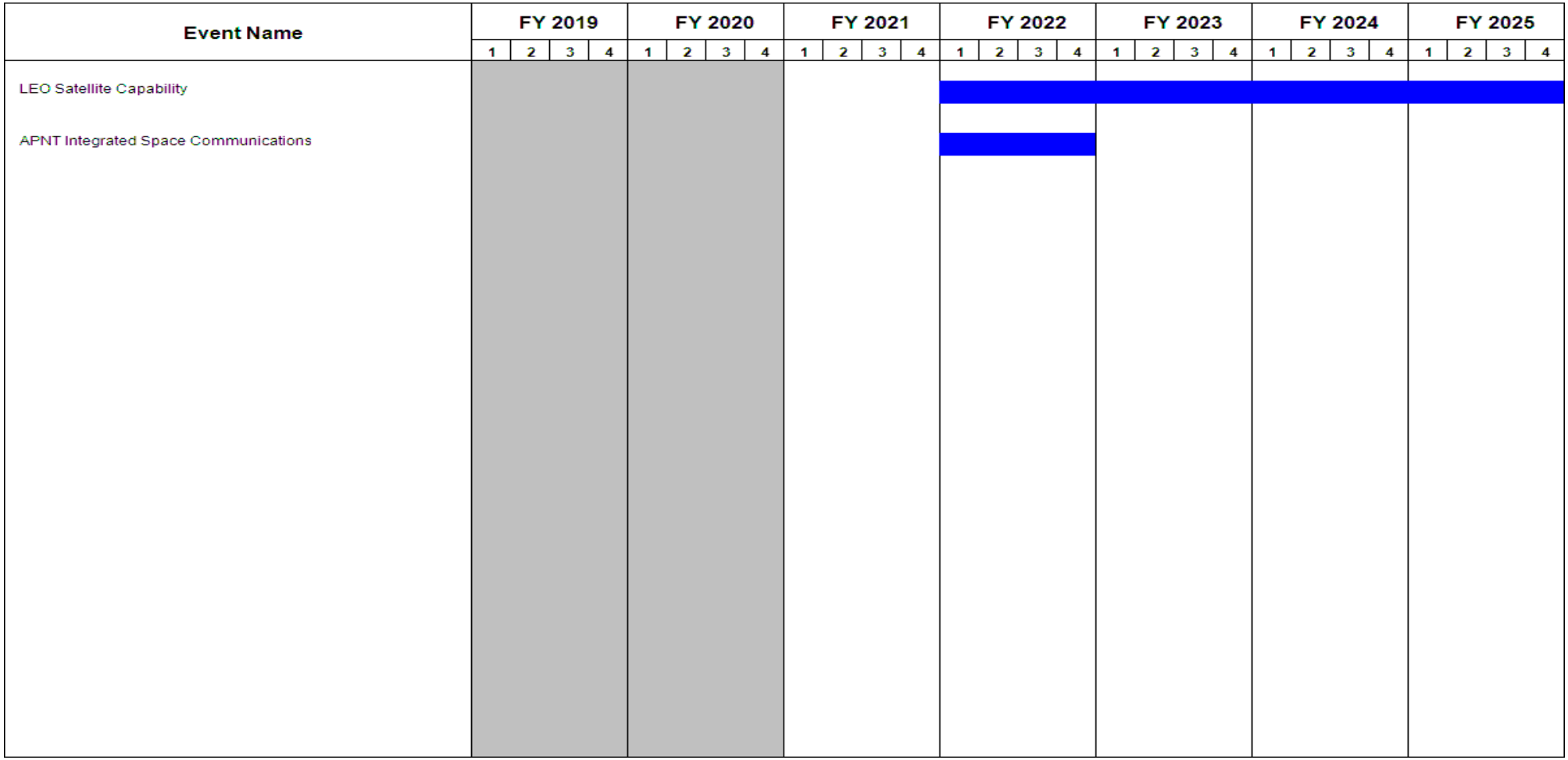

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604035A / *Low Earth Orbit (LEO) Satellite Capability*	**Project (Number/Name)** BX7 / *Low Earth Orbit (LEO) Satellite Capability*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
LEO Satellite Capability	1	2022	4	2025
APNT Integrated Space Communications	1	2022	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604100A / *Analysis Of Alternatives*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	9.396	10.023	10.082	-	10.082	10.216	10.418	10.754	10.864	0.000	71.753
EC7: *Analysis Of Alternatives*	-	9.396	10.023	10.082	-	10.082	10.216	10.418	10.754	10.864	0.000	71.753

A. Mission Description and Budget Item Justification

This Program Element (PE) provides funding for analytical support of Analysis of Alternatives. Analyses of Alternatives are statutory requirements for Major Defense Acquisition Programs and regulatory for all other programs. Based on Department of Defense Instruction (DoDI) 5000.02, Analyses of Alternatives are required to be completed for a new start program prior to its first Milestone Decision. The PE provides analytical capability for Pre-Milestone A programs that emerge outside the normal budget or POM cycles. Normally these programs are without program managers and require analysis to support Congressional, Defense and Army Senior Leader's requirement and acquisition needs and priorities. The Analyses of Alternatives support the preparation of the Capability Development Document, Key Performance Parameters and Thresholds values and tradeoff analysis. The cited work is consistent with the Army Futures Command Science and Technology priority focus areas and the Army Modernization Strategy and Guidance. Work in this PE is performed by analytical agencies such as The Research and Analysis Center and Data and Analysis Center. The Army is projecting to start work on multiple Analyses of Alternatives beginning in Fiscal Year 2021 (FY21), and will assess and fund the highest Congressional, Defense and Army Senior Leader's priorities during the year of execution.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	9.753	10.023	10.092	-	10.092
Current President's Budget	9.396	10.023	10.082	-	10.082
Total Adjustments	-0.357	0.000	-0.010	-	-0.010
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.357	-			
• Adjustments to Budget Years	-	-	-0.010	-	-0.010

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604100A / *Analysis Of Alternatives*	Project (Number/Name) EC7 / *Analysis Of Alternatives*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EC7: *Analysis Of Alternatives*	-	9.396	10.023	10.082	-	10.082	10.216	10.418	10.754	10.864	0.000	71.753
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides funding for analytical support of Analysis of Alternatives. Analyses of Alternatives are statutory requirements for Major Defense Acquisition Programs and regulatory for all other programs. Based on Department of Defense Instruction (DoDI) 5000.02, Analyses of Alternatives are required to be completed for a new start program prior to its first Milestone Decision. The Project provides analytical capability for Pre-Milestone A programs that emerge outside the normal budget or POM cycles. Normally these programs are without program managers and require analysis to support Congressional, Defense and Army Senior Leader's requirement and acquisition needs and priorities. The Analyses of Alternatives support the preparation of the Capability Development Document, Key Performance Parameters and Thresholds values and tradeoff analysis. The cited work is consistent with the Army Futures Command Science and Technology priority focus areas and the Army Modernization Strategy and Guidance. Work in this Project is performed by analytical agencies such as The Research and Analysis Center and Data and Analysis Center. The Army is projecting to start work on multiple Analyses of Alternatives beginning in Fiscal Year 2021 (FY21) and will assess and fund the highest Congressional, Defense and Army Senior Leader's priorities during the year of execution.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Analysis of Alternatives	9.396	9.567	10.082
Description: This Project provides funding for analytical support for the following efforts:			
FY 2020 Plans: FY 2020 funding supports analysis for new start programs that do not yet have a program manager assigned and to augment program manager funds where requirement decisions drive changes in scope or increased fidelity to achieve Congressional, Defense and Army Senior Leaders priority intent and interest. The analysis initiation, scope, and fidelity are determined in accordance with U.S. Army Future Command processes prior to the Materiel Development Decision and synchronized to support Joint and Army Requirement Oversight Councils' (JROC and AROC) and Acquisition Executive/Program decisions. Current projections indicate multiple new start programs will need to start their Analysis of Alternatives in FY 2020, including Unified Network Operations, Terrain Shaping Obstacles, Aircraft Survivability Equipment, Next Generation Aerial ISR/MDSS, Maneuver Short Range Air Defense, Assured Positioning, Navigation Timing, Precision Strike Missile, Terrestrial Layer Intelligence Support for Multi-Domain Battle/Joint Combined Army Maneuver, Robotic Combat Vehicle, and Future Tactical Unmanned Aircraft System. In addition, several Analyses of Alternatives started in FY 2019 will continue to require analysis funding into FY 2020, to include Next Generation Combat Vehicle, Optionally Manned Fighting Vehicle, and Future Vertical Lift, Future Attack Recon Aircraft Capability Set 1. In the Spring of 2020 (on or about 1 May) we can provide, as desired, the Committee an updated listing of projected FY 2020 new start program Analyses of Alternatives.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604100A / *Analysis Of Alternatives*	**Project (Number/Name)** EC7 / *Analysis Of Alternatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 funding supports analysis for new start programs that do not yet have a program manager assigned and to augment program manager funds where requirement decisions drive changes in scope or increased fidelity to achieve Congressional, Defense and Army Senior Leader's priority intent and interest. The analysis initiation, scope, and fidelity are determined in accordance with the U.S. Army Future Command processes prior to the Materiel Development Decision and synchronized to support Joint and Army Requirement Oversight Councils (JROC and AROC) and Acquisition Executive/Program decisions. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.456	-
Accomplishments/Planned Programs Subtotals	9.396	10.023	10.082

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604100A / *Analysis Of Alternatives*	Project (Number/Name) EC7 / *Analysis Of Alternatives*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.456		-		-		-	0.000	0.456	-
		Subtotal	-	-		0.456		-		-		-	0.000	0.456	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	0.357		-		-		-		-	0.000	0.357	-
		Subtotal	-	0.357		-		-		-		-	0.000	0.357	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Engineering (Analysis of Alternative)	MIPR	TRADOC Analysis Center : Fort Leavenworth, KS	3.803	5.223		-		-		-		-	0.000	9.026	-
System Engineering (Analysis of Alternative)	MIPR	Army Materiel Systems Analysis Activity : Aberdeen Proving Ground, MD	3.504	3.816		-		-		-		-	0.000	7.320	-
Analytical Support for Analyses of Alternatives	MIPR	TBD : TBD	23.572	-		9.567		10.082		-		10.082	0.000	43.221	-
		Subtotal	30.879	9.039		9.567		10.082		-		10.082	0.000	59.567	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	30.879	9.396		10.023		10.082		-		10.082	0.000	60.380	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604100A / *Analysis Of Alternatives*	**Project (Number/Name)** EC7 / *Analysis Of Alternatives*

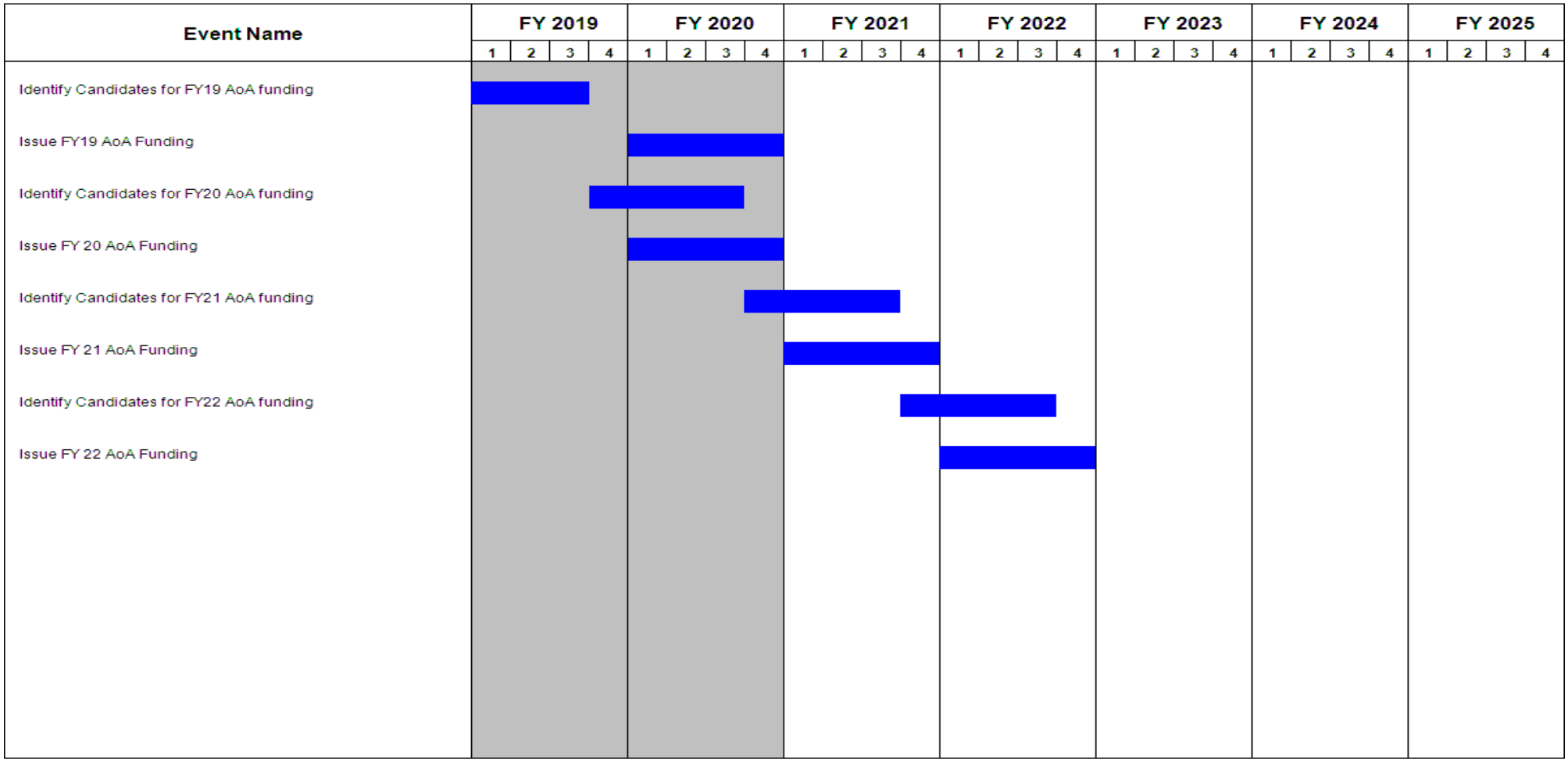

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604100A / *Analysis Of Alternatives*	**Project (Number/Name)** EC7 / *Analysis Of Alternatives*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Identify Candidates for FY19 AoA funding	4	2018	3	2019
Issue FY19 AoA Funding	1	2020	4	2020
Identify Candidates for FY20 AoA funding	4	2019	3	2020
Issue FY 20 AoA Funding	1	2020	4	2020
Identify Candidates for FY21 AoA funding	4	2020	3	2021
Issue FY 21 AoA Funding	1	2021	4	2021
Identify Candidates for FY22 AoA funding	4	2021	3	2022
Issue FY 22 AoA Funding	1	2022	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604101A *I Small Unmanned Aerial Vehicle (SUAV) (6.4)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	1.378	-	1.378	1.387	1.392	1.753	1.786	Continuing	Continuing
BR6: *Small Unmanned Aircraft System (6.4)*	-	0.000	0.000	1.378	-	1.378	1.387	1.392	1.753	1.786	Continuing	Continuing

Note

Funding has been moved to Program Element (PE) 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.

A. Mission Description and Budget Item Justification

The Rucksack Portable Unmanned Aircraft System (RPUAS) Family of Small Unmanned Aircraft System (FoSUAS) provides battalion and below ground maneuver elements with critical situational awareness and enhanced force protection. The system provides the small unit commander an organic and responsive reconnaissance and targeting capability with real-time Full Motion Video and sensor data. Other compatible receivers, such as the One System Remote Video Terminal and appropriately equipped manned platforms may also receive the FoSUAS products.

The RPUAS FoSUAS provides the battalion and below ground maneuver elements with an organic, on-demand, asset to develop situational awareness, enhance force protection, and secure routes, points, and areas. The system provides the small unit commander an organic and responsive reconnaissance and targeting capability with real-time Full Motion Video and sensor data. The RPUAS FoSUAS includes a combination of three separate hand-launched mission specific configurable aircraft that do not require an improved launch/recovery. The three separate mission specific configurable Unmanned Aircraft (UA) are the Short Range Reconnaissance (SRR), the Medium Range Reconnaissance (MRR), and the Long Range Reconnaissance (LRR). In addition to the aircraft, the system contains ground control equipment, which includes an interoperable handheld ground control station (H-GCS) which incorporates the Tactical Open Government Owned Architecture (TOGA). FoSUAS will utilize existing RQ-11 in a system of systems fielding concept, with SRR and LRR options under development.

Justification: FY 2021 Research, Development, Test, and Evaluation (RDT&E) Base funding of $1.379 million for Program Management Engineering support and to meet Capabilities Production Document (CPD) Increment II Block II related requirements. Specifically, to conduct advanced component development activities for SRR and LRR and efforts to evaluate LRR prototype systems in high fidelity and realistic operating environments.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604101A *I Small Unmanned Aerial Vehicle (SUAV) (6.4)*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	1.378	-	1.378
Total Adjustments	0.000	0.000	1.378	-	1.378
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	1.378	-	1.378

Change Summary Explanation

Funding has been moved to PE 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	Project (Number/Name) BR6 / *Small Unmanned Aircraft System (6.4)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BR6: *Small Unmanned Aircraft System (6.4)*	-	0.000	0.000	1.378	-	1.378	1.387	1.392	1.753	1.786	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funding has been moved to Program Element (PE) 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.

A. Mission Description and Budget Item Justification

The Family of Small Unmanned Aircraft System (FoSUAS) provides battalion and below ground maneuver elements with critical situational awareness and enhanced force protection. The system provides the small unit commander an organic and responsive reconnaissance and targeting capability with real-time Full Motion Video and sensor data. Other compatible receivers, such as the One System Remote Video Terminal and appropriately equipped manned platforms may also receive the FoSUAS products.

The Rucksack Portable Unmanned Aircraft Systems (RPUAS) FoSUAS provides the battalion and below ground maneuver elements with an organic, on-demand, asset to develop situational awareness, enhance force protection, and secure routes, points, and areas. The system provides the small unit commander an organic and responsive reconnaissance and targeting capability with real-time Full Motion Video and sensor data. The RPUAS FoSUAS includes a combination of three separate hand-launched mission specific configurable aircraft that do not require an improved launch/recovery. The three separate mission specific configurable Unmanned Aircraft (UA) are the Short Range Reconnaissance (SRR), the Medium Range Reconnaissance (MRR), and the Long Range Reconnaissance (LRR). In addition to the aircraft, the system contains ground control equipment, which includes an interoperable handheld ground control station (H-GCS) which incorporates the Tactical Open Government Owned Architecture (TOGA). FoSUAS will utilize existing RQ-11 in a system of systems fielding concept, with SRR and LRR options under development.

Justification: FY 2021 Research, Development, Test, and Evaluation (RDT&E) Base funding of $1.723 million for Program Management Engineering support and to meet Capabilities Production Document (CPD) Increment II Block II related requirements. Specifically, to conduct advanced component development activities for SRR and LRR and efforts to evaluate LRR prototype systems in high fidelity and realistic operating environments.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Component Development and Integration	-	-	0.542
Description: Engineering to develop and integrate new components into SRR and engineering to develop new components for LRR.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	**Project (Number/Name)** BR6 / *Small Unmanned Aircraft System (6.4)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Advanced component development efforts for LRR and SRR. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding has been moved to PE 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.			
Title: System Engineering Program Management ***Description:*** System Engineering Program Management support during development and integration of components for SRR air vehicles and engineering to develop new components for LRR.. ***FY 2021 Plans:*** System Engineering and Program Management support of advanced component development activities for LRR and SRR. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding has been moved to PE 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.	-	-	0.136
Title: System Test and Evaluation ***Description:*** Testing to Evaluate components for the LRR and SRR air vehicles. ***FY 2021 Plans:*** Testing to evaluate efforts to develop and integrate components for LRR and SRR air vehicles. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding has been moved to PE 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.	-	-	0.700
Accomplishments/Planned Programs Subtotals	-	-	1.378

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RA7: *RQ-11 Raven (MIP)*	6.180	3.218	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• BR7: *Small Unmanned Aircraft System (6.5)*	-	-	5.999	-	5.999	2.407	6.382	9.009	3.018	Continuing	Continuing
• A00010: *RQ-11 (RAVEN)*	46.438	21.420	20.851	-	20.851	16.397	16.581	21.342	21.560	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	**Project (Number/Name)** BR6 / *Small Unmanned Aircraft System (6.4)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

Funding has been moved to PE 0604101A Small Unmanned Aerial Vehicle (SUAV) (6.4) from PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	Project (Number/Name) BR6 / *Small Unmanned Aircraft System (6.4)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Engineering Program Management	TBD	To Be Determined : To Be Determined	-	-		-		0.136		-		0.136	Continuing	Continuing	Continuing
		Subtotal	-	-		-		0.136		-		0.136	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Component development and Integration	TBD	To Be Determined : To Be Determined	-	-		-		0.542	Jun 2021	-		0.542	Continuing	Continuing	Continuing
		Subtotal	-	-		-		0.542		-		0.542	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Test and Evaluation	TBD	To Be Determined : To Be Determined	-	-		-		0.700	Aug 2021	-		0.700	Continuing	Continuing	Continuing
		Subtotal	-	-		-		0.700		-		0.700	Continuing	Continuing	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		1.378		-		1.378	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	**Project (Number/Name)** BR6 / *Small Unmanned Aircraft System (6.4)*

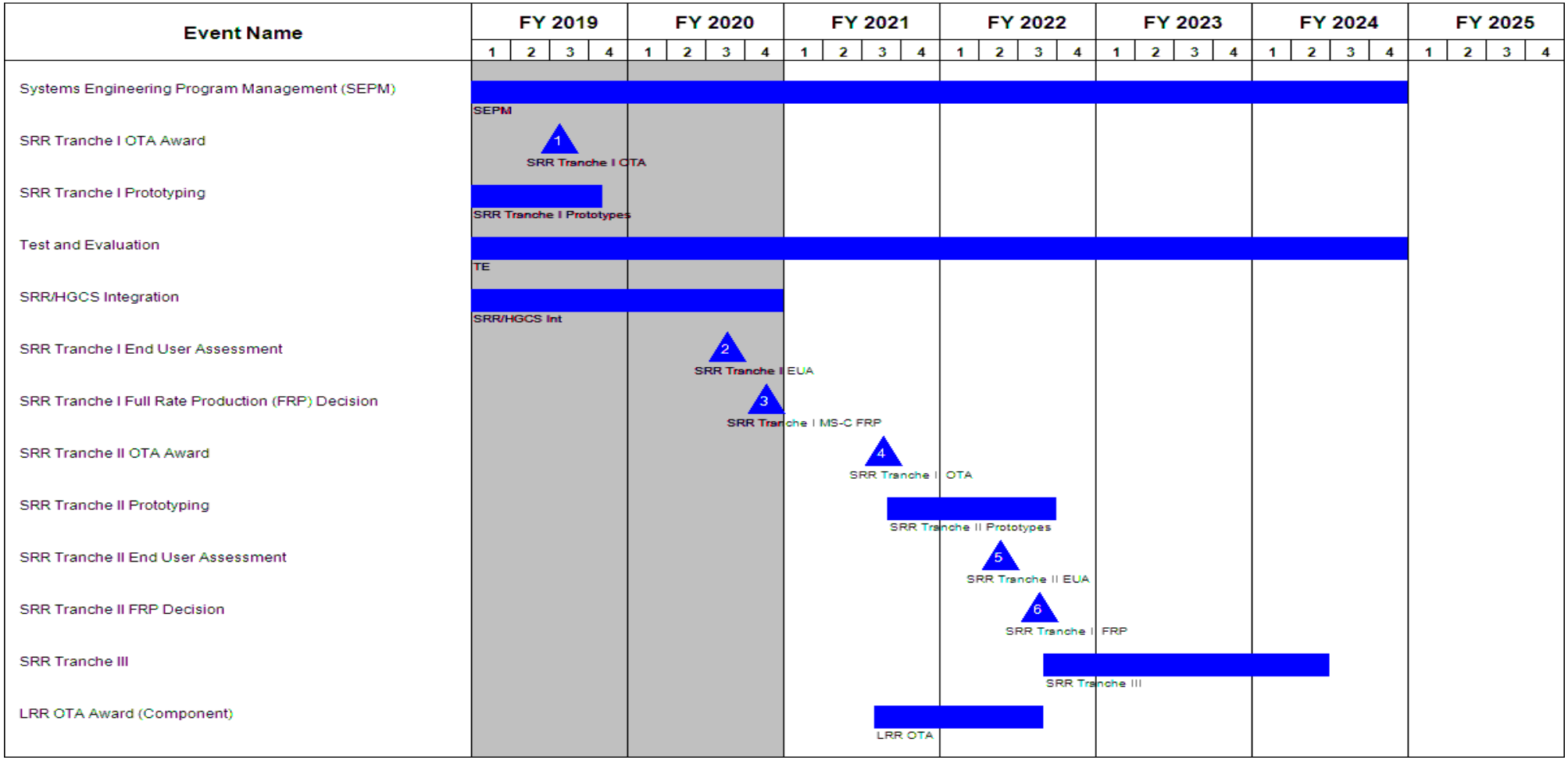

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	**Project (Number/Name)** BR6 / *Small Unmanned Aircraft System (6.4)*

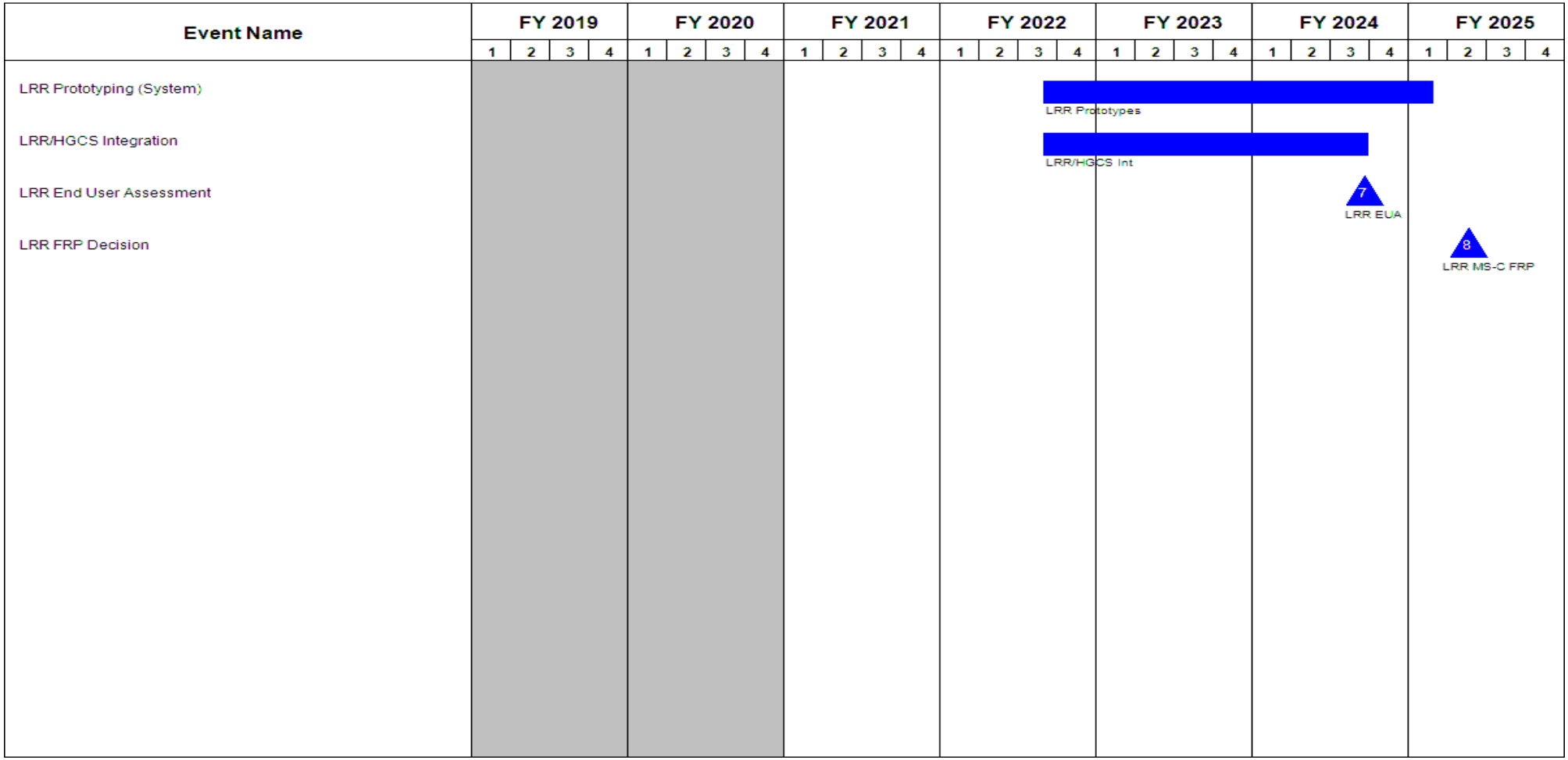

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604101A / *Small Unmanned Aerial Vehicle (SUAV) (6.4)*	**Project (Number/Name)** BR6 / *Small Unmanned Aircraft System (6.4)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Tactical Open Government Owned Architecture Development	4	2014	4	2014
Tactical Open Government Architecture Test Event 2	3	2015	3	2015
Systems Engineering Program Management (SEPM)	2	2018	4	2024
SRR Tranche I OTA Award	3	2019	3	2019
SRR Tranche I Prototyping	3	2018	4	2019
Test and Evaluation	4	2018	4	2024
SRR/HGCS Integration	2	2018	4	2020
SRR Tranche I End User Assessment	3	2020	3	2020
SRR Tranche I Full Rate Production (FRP) Decision	4	2020	4	2020
SRR Tranche II OTA Award	3	2021	3	2021
SRR Tranche II Prototyping	3	2021	3	2022
SRR Tranche II End User Assessment	2	2022	2	2022
SRR Tranche II FRP Decision	3	2022	3	2022
SRR Tranche III	3	2022	2	2024
LRR OTA Award (Component)	3	2021	3	2022
LRR Prototyping (System)	3	2022	1	2025
LRR/HGCS Integration	3	2022	3	2024
LRR End User Assessment	3	2024	3	2024
LRR FRP Decision	2	2025	2	2025

Note

Funding has been moved to this PE 0305232A Project RA7 RQ-11 UAV starting in FY 2021.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	12.393	40.745	40.083	-	40.083	45.239	40.922	38.264	8.993	Continuing	Continuing
EX8: *Future Unmanned Aircraft System (FUAS)*	-	12.393	40.745	40.083	-	40.083	45.239	40.922	38.264	8.993	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Future Unmanned Aircraft System (FUAS) is a critical system in the Multi-Domain Operations (MDO) concept that will employ MDO capabilities at all echelons and allow ground based forces to project power from land into other domains to defeat highly capable enemies, secure terrain, and consolidate gains. FUAS encompasses an array of capabilities from platoon soldiers to Division Commanders. The Army Requirements Oversight Council (AROC) approved the FUAS Initial Capabilities Document (ICD) on 6 Mar 2019. The FUAS ICD includes requirements for Future Tactical UAS (FTUAS), Air Launched Effects (ALE), and Scalable Control Interface (SCI). Manned, optionally-manned, and unmanned systems will penetrate defense-in-depth environments by employing ALE with teaming and swarming effects to detect, decoy, jam radar and communications, conduct cyber-attack, spoof and jam Global Positioning System (GPS), and kinetic engagement.

The Future Vertical Lift Cross Functional Team (FVL CFT) FUAS line of effort is comprised of multiple components including the FTUAS for the Brigade Combat Team (BCT), and ALE. The FTUAS seeks to replace the RQ-7Bv2 Shadow assets within the BCTs. Key attributes of the FTUAS BCT focus on Rapid Deployability, Expeditionary Maneuver, and Mobility for adaptive and agile operations. FTUAS will consist of an aircraft subsystem that will include the airframe, propulsion, avionics, communications, navigation, and software systems; aircraft-specific ground support equipment including power generation, transportation, or command and control equipment; aircraft software; and required engineering, logistics, programmatic support. ALE extends tactical and operational reach, lethality, and protection to the advanced team as an attritable or optionally recoverable aerial capability that detects, identifies, locates, and reports threats; represents a credible decoy; disrupts threat communication, targeting and acquisition systems; and delivers lethal and non-lethal effects against those threats across Multi-Domain Operations.

Justification: Fiscal Year (FY) 2021 FTUAS Research Development Technology & Evaluation (RDT&E) Base funding of $40.122 million will be utilized for the following: 1) $16.797 million to support the FTUAS early development, 2) $20.000 million to support ALE Systems Analysis, 3) $3.325 million provides Systems Engineering and Program Management (SEPM) to support FTUAS.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604113A *I Future Tactical Unmanned Aircraft System (FTUAS)*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	12.393	40.745	20.122	-	20.122
Current President's Budget	12.393	40.745	40.083	-	40.083
Total Adjustments	0.000	0.000	19.961	-	19.961
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-10.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	19.961	-	19.961

Change Summary Explanation

FY 2021 FTUAS Research Development Technology & Evaluation (RDT&E) Base funding of $40.122 million will be utilized for the following: 1) $16.797 million to support the FTUAS early development, 2) $20.000 million to support ALE Systems Analysis, 3) $3.325 million provides SEPM to support FTUAS.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	Project (Number/Name) EX8 / *Future Unmanned Aircraft System (FUAS)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EX8: *Future Unmanned Aircraft System (FUAS)*	-	12.393	40.745	40.083	-	40.083	45.239	40.922	38.264	8.993	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Future Unmanned Aircraft System (FUAS) is a critical system in the Multi-Domain Operations (MDO) concept that will employ MDO capabilities at all echelons and allow ground based forces to project power from land into other domains to defeat highly capable enemies, secure terrain, and consolidate gains. FUAS encompasses an array of capabilities from platoon soldiers to Division Commanders. The Army Requirements Oversight Council (AROC) approved the FUAS Initial Capabilities Document (ICD) on 6 Mar 2019. The FUAS ICD includes requirements for Future Tactical UAS (FTUAS), Air Launched Effects (ALE), and Scalable Control Interface (SCI). Manned, optionally-manned, and unmanned systems will penetrate defense-in-depth environments by employing ALE with teaming and swarming effects to detect, decoy, jam radar and communications, conduct cyber-attack, spoof and jam Global Positioning System (GPS), and kinetic engagement.

The Future Vertical Lift Cross Functional Team (FVL CFT) FUAS line of effort is comprised of multiple components including the FTUAS for the Brigade Combat Team (BCT), and ALE. The FTUAS seeks to replace the RQ-7Bv2 Shadow assets within the BCTs. Key attributes of the FTUAS BCT focus on Rapid Deployability, Expeditionary Maneuver, and Mobility for adaptive and agile operations. FTUAS will consist of an aircraft subsystem that will include the airframe, propulsion, avionics, communications, navigation, and software systems; aircraft-specific ground support equipment including power generation, transportation, or command and control equipment; aircraft software; and required engineering, logistics, programmatic support. ALE extends tactical and operational reach, lethality, and protection to the advanced team as an attritable or optionally recoverable aerial capability that detects, identifies, locates, and reports threats; represents a credible decoy; disrupts threat communication, targeting and acquisition systems; and delivers lethal and non-lethal effects against those threats across Multi-Domain Operations.

Justification: Fiscal Year (FY) 2021 FTUAS Research Development Technology & Evaluation (RDT&E) Base funding of $40.122 million will be utilized for the following: 1) $16.797 million to support the FTUAS early development, 2) $20.000 million to support ALE Systems Analysis, 3) $3.325 million provides Systems Engineering and Program Management (SEPM) to support FTUAS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Multi-Domain Task Force (MDTF) Demonstration	10.800	18.079	-
Description: Funding for United States Army Pacific (USARPAC) Multi-Domain Task Force (MDTF) Demonstration supports UAS aircraft, payload and Multi-Function Electronic Warfare (MFEW) demonstration, which will inform FTUAS requirements.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding was used for USARPAC MDTF Demonstration supports UAS aircraft, payload and MFEW demonstration which informs FTUAS requirements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease to $0 in FY 2021 due to FVL CFT direction to begin FTUAS early development.			
Title: Air Launched Effects (ALE) Systems Analysis ***Description:*** ALE systems analysis in preparation for a Materiel Development Decision (MDD), and to inform requirements. The PM will conduct market research, systems engineering analyses and conduct an assessment of how the proposed candidate materiel solution approaches are technically feasible and have the potential to effectively address capability gaps, desired operational attributes, and associated external dependencies. ***FY 2020 Plans:*** Funded ALE market research, early systems engineering analyses and assessment of candidate materiel solution approaches through air vehicle and payload, and mission systems architecture demonstrations. ***FY 2021 Plans:*** Continue to fund ALE Increment 1a demonstrations, engineering analysis, integration, prototyping, assessment of proposed material solution approaches in support of host platform integration. Continue to support the development of the Modular Open Systems Architecture and SCI required for ALE.	-	20.000	20.000
Title: System Engineering/Program Management ***Description:*** SEPM ***FY 2020 Plans:*** Funded SEPM to support FTUAS pre-milestone decision requirements such as independent cost estimates and other required milestone documents. ***FY 2021 Plans:*** Funding to continue SEPM to support FUAS milestone decision requirements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase of $0.659 million in FY 2021 required to support systems engineering and milestone decision requirements.	1.593	2.666	3.325
Title: Future Tactical Unmanned Aircraft System (FTUAS)	-	-	16.758

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: This is a New Effort in FY 2021. The FTUAS platform is intended to be a runway independent Group 2/3 unmanned aircraft that provides the Brigade Combat Teams with expeditionary, intelligence, surveillance, and reconnaissance (ISR) with improved target location and designation. ***FY 2021 Plans:*** Funds will development / integration of required FTUAS components (Miniaturized Type 1 Encryption, Miniaturized Mode 5/S IFF, Scalable Control Interface (SCI), and Tactical Data Link). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase $16.797 million in FY 2021 due to FVL CFT direction to begin FTUAS early development.			
Accomplishments/Planned Programs Subtotals	12.393	40.745	40.083

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• A01310: *Tactical Unmanned Aircraft System (TUAS)*	-	12.100	1.101	-	1.101	25.345	38.100	55.400	90.752	0.000	222.798

Remarks

FY 2021 base procurement dollars in the amount of $1.101 million supports the FVL CFT FTUAS Demonstration: Specifically, the Program Management (PM) support necessary to conclude the FTUAS Demonstration.

D. Acquisition Strategy

The Aviation Platform - Requirements Development Division (AP-RDD) prepared an Initial Capabilities Document (ICD) that was approved by the AROC on 6 Mar 2019.

The FVL CFT is overseeing a demonstration effort in FY 2019 - 2021 that will inform the FTUAS requirement to develop capability that will ultimately replace the RQ-7Bv2 Shadow TUAS within the BCT formation. The Demonstration effort will focus on conducting analysis and obtaining field data that will inform the FTUAS Capability Development Document (CDD). A MDD review will be held in FY 2021.

AP-RDD - Prepared ALE Initial Capability Refinement Document (ICRD) that was approved by GEN John M. Murray, CG, AFC on 21 Oct 2019.

The plan to acquire ALE is through an incremental approach that allows rapid prototyping and fielding of technology to field available capabilities while continuing S&T efforts to mature and transition emerging technologies to fully realize required capabilities. This is accomplished through multiple prototype development activities for the air vehicle, payloads, and mission system architecture through, experiments, simulations, and demonstrations conducted in parallel and/or sequential timelines. The objective of this incremental effort is to develop and exhibit multiple ALE prototypes to enable a rapid transition from prototype to operational implementation in the

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

force. Increment 1A will be a COTS/GOTS system to enable technology maturation, systems integration, and potential initial capabilities. ALE program of record will be purpose built utilizing parallel efforts informed by S&T investments and information learned from the demonstration and testing of Increment 1A. Additional increments will leverage the mission system architecture, payload technologies and interfaces from the initial increment and seek to extend the range of ALE for missions in support of LRPF.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	Project (Number/Name) EX8 / *Future Unmanned Aircraft System (FUAS)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering and Program Management (SEPM)	Various	PM TUAS : Redstone Arsenal	-	1.593		2.666		3.325		-		3.325	Continuing	Continuing	-
		Subtotal	-	1.593		2.666		3.325		-		3.325	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Air Launched Effects (ALE) Systems Analysis	Various	PM TUAS : Redstone Arsenal	-	-		20.000		20.000		-		20.000	0.000	40.000	-
Future Tactical Unmanned Aircraft System (FTUAS)	Various	PM TUAS : Redstone Arsenal	-	-		-		16.758		-		16.758	0.000	16.758	-
		Subtotal	-	-		20.000		36.758		-		36.758	0.000	56.758	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi Domain Task Force (MDTF) UAS Demonstration	Various	Various : Various	-	10.800		18.079		-		-		-	10.000	38.879	-
		Subtotal	-	10.800		18.079		-		-		-	10.000	38.879	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	12.393		40.745		40.083		-		40.083	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

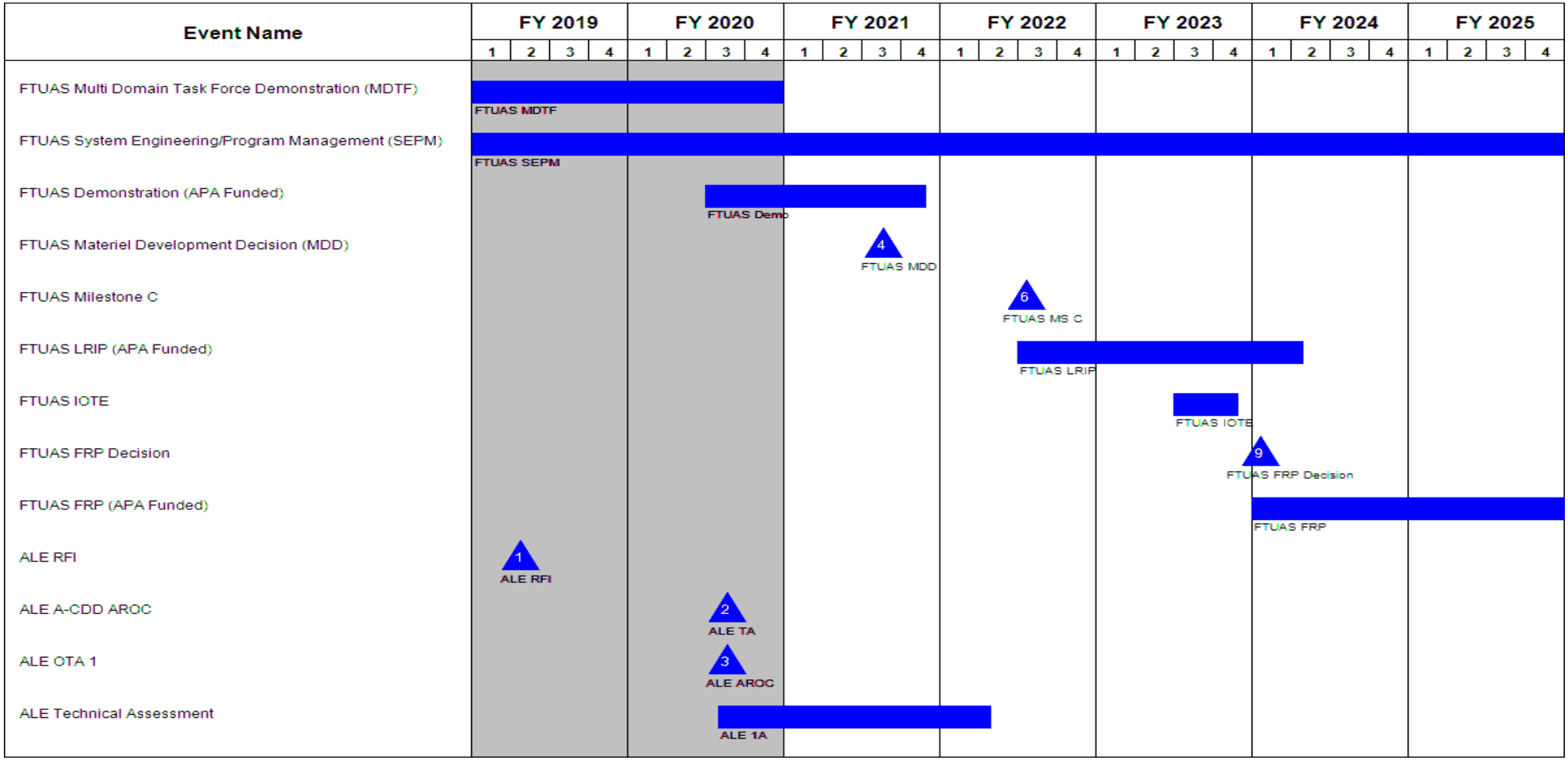

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

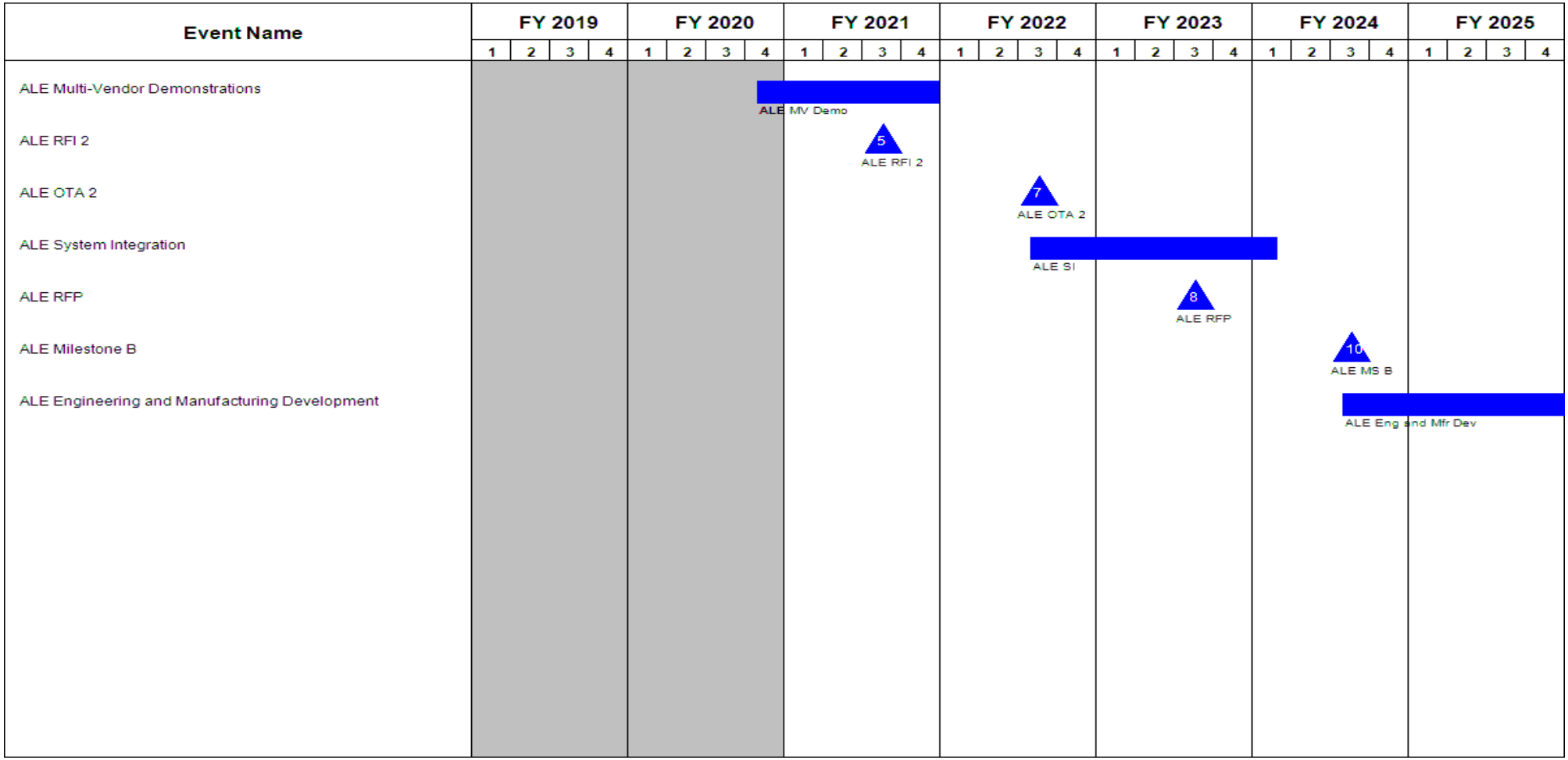

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604113A / *Future Tactical Unmanned Aircraft System (FTUAS)*	**Project (Number/Name)** EX8 / *Future Unmanned Aircraft System (FUAS)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
FTUAS Multi Domain Task Force Demonstration (MDTF)	1	2019	4	2020
FTUAS System Engineering/Program Management (SEPM)	1	2019	4	2025
FTUAS Demonstration (APA Funded)	3	2020	4	2021
FTUAS Materiel Development Decision (MDD)	3	2021	3	2021
FTUAS Milestone C	3	2022	3	2022
FTUAS LRIP (APA Funded)	3	2022	2	2024
FTUAS IOTE	3	2023	4	2023
FTUAS FRP Decision	1	2024	1	2024
FTUAS FRP (APA Funded)	1	2024	4	2028
ALE RFI	2	2019	2	2019
ALE A-CDD AROC	3	2020	3	2020
ALE OTA 1	3	2020	3	2020
ALE Technical Assessment	3	2020	2	2022
ALE Multi-Vendor Demonstrations	4	2020	4	2021
ALE RFI 2	3	2021	3	2021
ALE OTA 2	3	2022	3	2022
ALE System Integration	3	2022	1	2024
ALE RFP	3	2023	3	2023
ALE Milestone B	3	2024	3	2024
ALE Engineering and Manufacturing Development	3	2024	3	2027

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	84.981	379.772	376.373	-	376.373	332.007	241.235	87.419	88.298	Continuing	Continuing
EX2: *Lower Tier Air Missile Defense (LTAMD) Capability*	-	84.981	379.772	376.373	-	376.373	332.007	241.235	87.419	88.298	Continuing	Continuing

A. Mission Description and Budget Item Justification

Lower Tier Air Missile Defense Sensor (LTAMDS) program will provide the required sensing capabilities, surveillance and fire control in the lower tier portion of the Army Integrated Air and Missile Defense (IAMD) of the ballistic missile defense battlespace. The acquisition program competitively selected the LTAMDS prime vendor in 1st Quarter (Q) Fiscal Year (FY) 2020 to build six Production Representative Unit sensors under the authority of Section 804 Rapid Prototyping. The sensor/radar set (RS) replaces the baseline PATRIOT RS (AN/MPQ-65A) in an IAMD enabled PATRIOT Battalion mitigating the risk associated with threat changes while also addressing growing obsolescence and increasing Operational & Support (O&S) cost. The LTAMDS capability addresses critical capability gaps, modernizes technology, and increases reliability and maintainability. The LTAMDS capability increases sensor/radar performance to maximize the inherent PATRIOT Advanced Capability (PAC-3) Missile Segment Enhanced (MSE) Interceptor capabilities to engage threats.

FY 2021 base dollars in the amount of $376.373 million supports the acceleration of the Lower Tier Air and Missile Defense Sensor (LTAMDS) program. FY 2021 tasks include Production Representative Units manufacturing (purchase of 3 prototypes, final phase of Contractor Verification Testing and initial Government Developmental Testing and Qualification Testing events), acquiring targets, acquiring long lead items, Pre-Planned Product Improvements (P3I), and supporting programmatic and engineering activities needed to integrate the LTAMDS equipment with the Integrated Battle Command System, the PAC-3 Interceptor, and the Integrated Fire Control Network relay.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	89.248	427.772	376.738	-	376.738
Current President's Budget	84.981	379.772	376.373	-	376.373
Total Adjustments	-4.267	-48.000	-0.365	-	-0.365
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-48.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-4.267	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.365	-	-0.365

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	Project (Number/Name) EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EX2: *Lower Tier Air Missile Defense (LTAMD) Capability*	-	84.981	379.772	376.373	-	376.373	332.007	241.235	87.419	88.298	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Lower Tier Air and Missile Defense Sensor (LTAMDS) satisfies the Warfighter's capability requirements in the Integrated Air and Missile Defense domain. The program provides the required sensing capabilities in the lower tier portion of the air and missile defense battlespace and expands the battlespace for the PATRIOT Advanced Capability (PAC-3) Missile Segment Enhancement (MSE) interceptor, and will be upgradable for the Future Interceptor. The Army Requirements Oversight Council (AROC) approved LTAMDS requirements in April 2016.

The Army competitively selected the LTAMDS, which will counter air and missile defense threats using state-of-the-art technology, while reducing operating and sustainment costs, mitigating obsolescence, and increasing reliability and maintainability.

LTAMDS Fiscal Year (FY) 2021 funding will be utilized for Production Representative Units manufacturing (final phase of Contractor Verification Testing and purchase of three prototypes), acquiring targets, acquiring long lead items, and supporting programmatic and engineering activities needed to integrate the LTAMDS equipment with the Integrated Battle Command System, the PAC-3 Interceptor, and the Integrated Fire Control Network relay. FY 2021 funding supports additional capabilities to meet full LTAMDS requirements, to include Pre-Planned Product Improvements (P3I). It further supports initial Government Developmental Testing and Qualification Testing events. FY 2021 activities support the FY 2018 National Defense Authorization Act (NDAA) requirement to accelerate LTAMDS Initial Operational Capability to no later than December 2023.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Lower Tier Missile Defense Sensor	84.981	362.526	376.373
Description: Provides the required sensing capabilities in the lower tier portion of the air and missile defense battlespace and expands the battlespace for the PAC-3 MSE interceptor.			
FY 2020 Plans: - Initiated LTAMDS prototype manufacture and integration activities - Conducted knowledge point and functional reviews of vendor prototypes - Initiated Contractor Verification Testing			
FY 2021 Plans: -Continue procurement of prototypes -Integration of LTAMDS with IAMD Battle Command System (IBCS)			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	**Project (Number/Name)** EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
-Acquisition of targets -Integration of LTAMDS with PAC-2 Interceptor -Integration of LTAMDS with PAC-3 Family of Missiles -Develop and integrate additional capabilities through P3I efforts -Completion of Contractor Verification Testing -Initiation of Development Testing -Initiation of Qualification Testing ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Realignment of funds in FY20 cost categories Product Development, Test/Planning/Targets/Interceptors, and Product Development Support was necessary to support requirements (MEP 810, Advanced Threat), additional flight tests, and purchase of additional interceptors. Delta between budget years FY20 and FY21 for LTAMDS (0604114A) is less than 10%.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	17.246	-
Accomplishments/Planned Programs Subtotals	84.981	379.772	376.373

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• C12101: *Lower Tier Air and Missile Defense Sensor*	-	-	0.000	-	0.000	35.960	147.055	306.669	348.624	Continuing	Continuing

Remarks

D. Acquisition Strategy

To enhance the Warfighter's lethality, survivability, and combat effectiveness, the Army used full and open competitive processes within Other Transactions Authority (OTA) agreements for rapid prototyping, qualification, and initial fielding efforts to meet the intent of FY 2018 NDAA Congressional language. Middle Tier Acquisition approach (Section 804, FY 2016 NDAA) authorities were leveraged in conjunction with the OTA to facilitate and accelerate the LTAMDS program. OTA promotes non-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	**Project (Number/Name)** EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*

traditional defense contractor involvement, cost sharing arrangements, and accelerates schedules. A FEDBIZOPS announcement and subsequent LTAMDS Industry Day generated government-contractor dialogue, provided contractor cost and schedule estimates, verified industry technology and manufacturing readiness, and informed stakeholders on design approaches and potential materiel solutions. This approach also provides senior leader decision points along the way to make informed decisions based on industry ability to meet threshold requirements. The Sense-Off conducted in 3rd Quarter (Q) FY 2019 along with industry proposals enabled the selection of an LTAMDS single vendor with the subsequent award of the OTA Agreement in 1Q FY 2020. Planned demonstration of military utility of the LTAMDS PRUs occurs in 3Q FY 2022 during the Early User Test (EUT). A planned Urgent Materiel Release decision point occurs in 1Q FY 2023 subsequent to a declaration of success for the Rapid Prototyping program evidenced by the EUT results. The UMR decision point enables the decision for Rapid Fielding and the procurement of the follow on sixteen sensors planned in 1Q FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	Project (Number/Name) EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Program Management	MIPR	Various : Redstone Arsenal, AL	9.800	4.515	Oct 2018	2.350	Oct 2019	4.100	Oct 2020	-		4.100	Continuing	Continuing	-
Systems Engineering and Technical Assistance (SETA)	Various	Systems Engineering and Technical Assistance : Huntsville, AL	8.000	5.000	Oct 2018	3.509	Oct 2019	6.000	Oct 2020	-		6.000	Continuing	Continuing	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		17.246		-		-		-	0.000	17.246	-
		Subtotal	17.800	9.515		23.105		10.100		-		10.100	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Concept Definition	C/CPFF	Raytheon, Lockheed Martin, Technovative Applications, Northrop Grumman : Andover MA; Liverpool NY; Brea CA; Linthicum MD	64.817	10.000	Jan 2019	-		-		-		-	0.000	74.817	-
Product Development Support	C/Various	University Affiliated Research Center (UARC); MIT; The Federally Funded Research and Development Center (FFRDC) : Various	-	3.000	Oct 2018	6.349	Dec 2019	5.250	Oct 2020	-		5.250	Continuing	Continuing	-
Prototype Manufacturing and Integration (Rapid Prototyping)	C/FFP	Raytheon : Various	-	51.366	Oct 2019	293.703	Jan 2020	228.774	Feb 2021	-		228.774	Continuing	Continuing	-
Development Engineering/ Contractor SEPM & Test	Various	CCDC WDI; Picatinny Arsenal : Various	-	-		-		103.999	Feb 2021	-		103.999	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	Project (Number/Name) EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	64.817	64.366		300.052		338.023		-		338.023	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/Various	Army Laboratories, S3I System Integration Laboratory, CCDC : Various	-	-		2.454	Dec 2019	2.250	Dec 2020	-		2.250	Continuing	Continuing	-
		Subtotal	-	-		2.454		2.250		-		2.250	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning/Targets/ Interceptors/U.S. Other Government Agencies (OGAs)	MIPR	RDEC, SED, WSMR-T&E Support : Huntsville, AL; White Sands, NM	8.595	11.100	Jan 2019	54.161	Jan 2020	26.000	Feb 2021	-		26.000	Continuing	Continuing	-
		Subtotal	8.595	11.100		54.161		26.000		-		26.000	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	91.212	84.981		379.772		376.373		-		376.373	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	**Project (Number/Name)** EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*

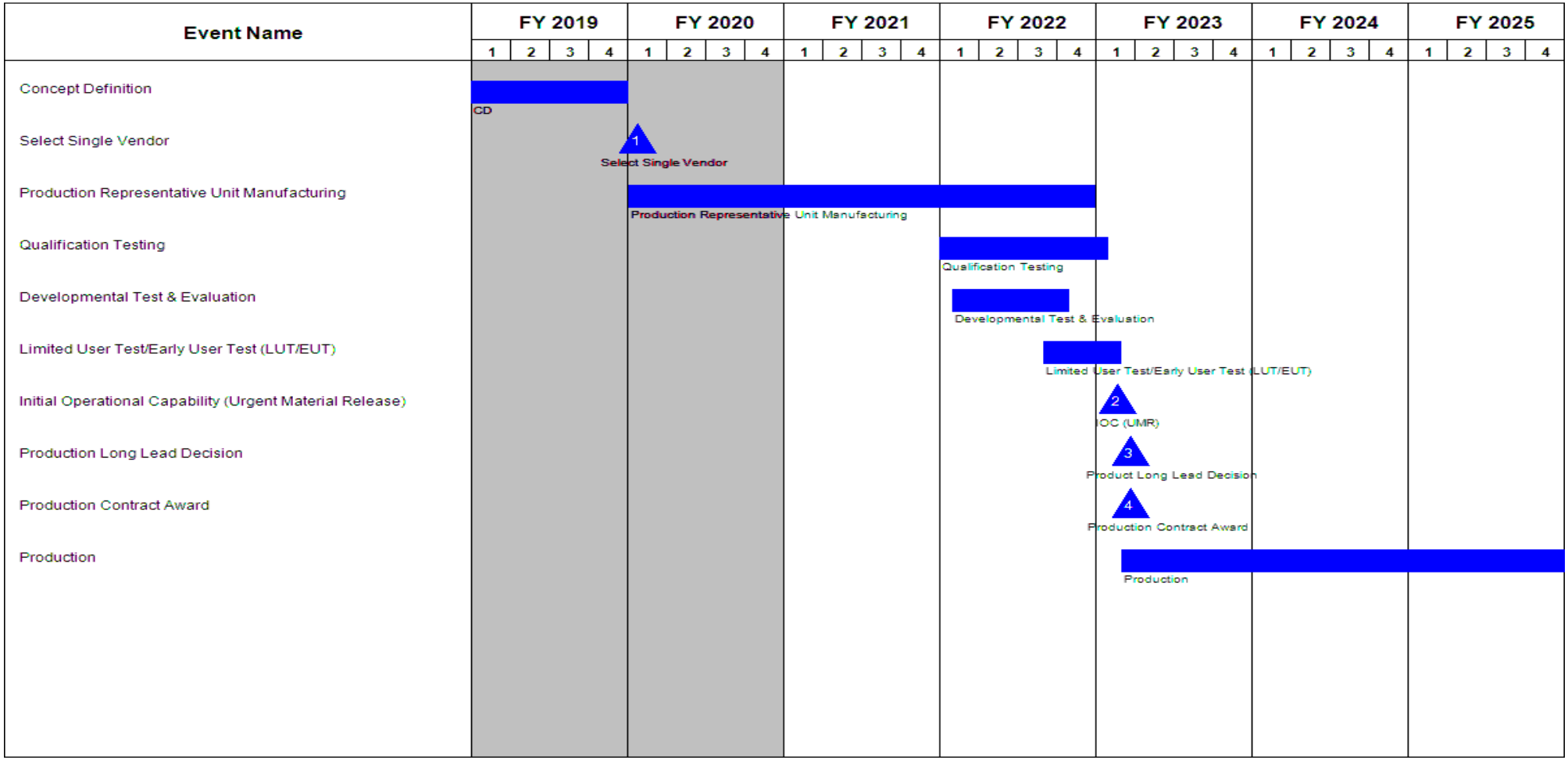

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604114A / *Lower Tier Air Missile Defense (LTAMD) Sensor*	**Project (Number/Name)** EX2 / *Lower Tier Air Missile Defense (LTAMD) Capability*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Concept Definition	4	2017	4	2019
Select Single Vendor	1	2020	1	2020
Production Representative Unit Manufacturing	1	2020	4	2022
Qualification Testing	1	2022	1	2023
Developmental Test & Evaluation	1	2022	4	2022
Limited User Test/Early User Test (LUT/EUT)	3	2022	1	2023
Initial Operational Capability (Urgent Material Release)	1	2023	1	2023
Production Long Lead Decision	1	2023	1	2023
Production Contract Award	1	2023	1	2023
Production	1	2023	3	2027

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	91.749	179.676	156.834	-	156.834	268.981	314.698	253.827	254.563	0.000	1,520.328
AX3: *Technology Maturation Initiatives*	-	0.000	0.000	13.986	-	13.986	138.114	296.715	253.827	254.563	0.000	957.205
AX4: *Computational Prototyping Environment (CPE)*	-	0.000	3.966	5.421	-	5.421	6.912	0.000	0.000	0.000	0.000	16.299
AX5: *Next Generation Close Combat Missile*	-	0.000	9.000	4.995	-	4.995	0.000	0.000	0.000	0.000	0.000	13.995
AX6: *Active Protection Systems Integration*	-	0.000	7.400	10.490	-	10.490	0.000	0.000	0.000	0.000	0.000	17.890
AX7: *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	-	0.000	18.650	8.142	-	8.142	0.000	0.000	0.000	0.000	0.000	26.792
AX8: *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	-	0.000	27.200	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.200
AX9: *Adv Mobility Experimental Prototype Adv Tech*	-	0.000	10.500	15.785	-	15.785	10.490	7.193	0.000	0.000	0.000	43.968
AY1: *MUM-T Platform Enabler*	-	0.000	7.200	4.496	-	4.496	4.196	0.000	0.000	0.000	0.000	15.892
AY2: *Army Operational Fires*	-	0.000	18.900	28.372	-	28.372	38.336	10.790	0.000	0.000	0.000	96.398
AY3: *Strategic Long Range Cannon*	-	0.000	76.860	65.147	-	65.147	70.933	0.000	0.000	0.000	0.000	212.940
DS3: *Technology Maturation Initiatives*	-	91.749	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	91.749

A. Mission Description and Budget Item Justification

This Program Element (PE) funds experimental prototyping and demonstration of selected technology enabled capabilities to support advanced ground systems, aviation systems, command, control, communications & reconnaissance systems and equipment, precision weapons, High Energy Laser (HEL) systems, and Soldier equipment. Funding facilitates maturation and demonstration of advanced technologies and systems in relevant environments and tactical/operational scenarios as well as the maturation and demonstration of a robust Virtual Proving Ground (VPG) for rapid, accurate, and computational prototyping of major Army platforms. Benefits include maturing technologies to a goal of Technology Readiness Level (TRL) 7, informing emerging requirements for future programs of record, and reducing technology risk in order to transition of leap-ahead capabilities into acquisition programs. Technology Maturation Initiative efforts mature and integrate advanced component technologies into system and sub-system technology demonstrators and experimental prototypes, which are then validated and transitioned to priority

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*

Army experimentation efforts and programs of record. This PE provides the Army with an improved mechanism for enabling greater competition in the latter stages of technology maturation and establishes a closer alignment between Science and Technology (S&T) efforts and acquisition programs.

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

Work in this PE is performed by the United States (U.S.) Army Futures Command (AFC), the Engineer Research Development Center (ERDC), and U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT).

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	95.229	196.676	156.986	-	156.986
Current President's Budget	91.749	179.676	156.834	-	156.834
Total Adjustments	-3.480	-17.000	-0.152	-	-0.152
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-17.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.480	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.152	-	-0.152

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX3 / *Technology Maturation Initiatives*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX3: *Technology Maturation Initiatives*	-	0.000	0.000	13.986	-	13.986	138.114	296.715	253.827	254.563	0.000	957.205
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY2021.

This Project is a New Start in Fiscal Year 2021 (FY21).

A. Mission Description and Budget Item Justification

This Project funds the Technology Maturation Initiative, which matures and integrates component technologies into early system and sub-system experimental prototypes for demonstration in relevant environments and tactical/operational scenarios. The Technology Maturation Initiative takes emerging Science and Technology (S&T) products to a goal of Technology Readiness Level (TRL) 7, integrating them into technology demonstrators and experimental prototypes that inform requirements and reduce the risk of technology insertion for future acquisition programs. This Initiative streamlines the development and insertion of mature technologies that support advanced ground systems; aviation systems; command, control, communication & reconnaissance systems and equipment; precision weapons; High Energy Laser (HEL) systems; and Soldier equipment. It provides the Army an improved mechanism for incorporating innovative technologies and advanced capabilities in the early stages of acquisition program planning, and more closely aligns high-priority S&T products and future Programs of Record.

Army senior leadership approves Technology Maturation Initiative projects prior to budget year programming based on priority and opportunity, ensuring that demonstrations have a high potential for filling capability gaps and transitioning. Approved Technology Maturation Initiative projects are typically 2-4 years in duration and are budgeted under Projects AX4, AX5, AX6, AX7, AX8, AX9, AY1, AY2, and AY3.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Future Vertical Lift (FVL) Helmet Mounted Display	-	-	3.900
Description: This effort will integrate and demonstrate a TRL 7 rotorcraft Helmet Mounted Display (HMD) compatible with current 56P helmets and FVL distributed aperture systems (DASs). This will enable heads up, eyes out pilotage and improve situational awareness (SA) and maneuver for FVL pilots in all conditions. The HMD will have a head tracker system that is self-contained and self-calibrating.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX3 / *Technology Maturation Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will mature and integrate novel HMDs with high bright full color high resolution organic light-emitting diodes (OLEDs), low cost free-form prism optics, and low cost micro complementary metal?oxide?semiconductor (CMOS) cameras optimized for utilization by Army aviators in all pilotage conditions; and mature inertial measurement unit (IMU) technologies for integration with head tracking hardware/software. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This FY21 effort was approved by the Army Prototyping Board to support the Army's Modernization Priority for Future Vertical Lift.			
Title: Large Caliber Armament System Prototype ***Description:*** This effort will integrate and demonstrate a TRL 7 lightweight armament system for current and future combat platforms. ***FY 2021 Plans:*** Will mature and integrate 120mm reduced-recoil armament system in a test bed configuration to inform Next Generation Combat Vehicle requirements; will fabricate turret and ammunition and handling systems for integration. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This FY21 effort was approved by the Army Prototyping Board to support the Army's Modernization Priority for Next Generation Combat Vehicles.	-	-	10.086
Accomplishments/Planned Programs Subtotals	-	-	13.986

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX3 / *Technology Maturation Initiatives*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Future Vertical Lift Helmet Mounted Display (FVL HMD)	C/Various	AFC : Fort Belvoir, VA	-	-		-		3.900		-		3.900	13.000	16.900	-
Large Caliber Armament System Prototype	C/Various	AFC : Picatinny, NJ	-	-		-		10.086		-		10.086	18.400	28.486	-
		Subtotal	-	-		-		13.986		-		13.986	31.400	45.386	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		13.986		-		13.986	31.400	45.386	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX3 / *Technology Maturation Initiatives*

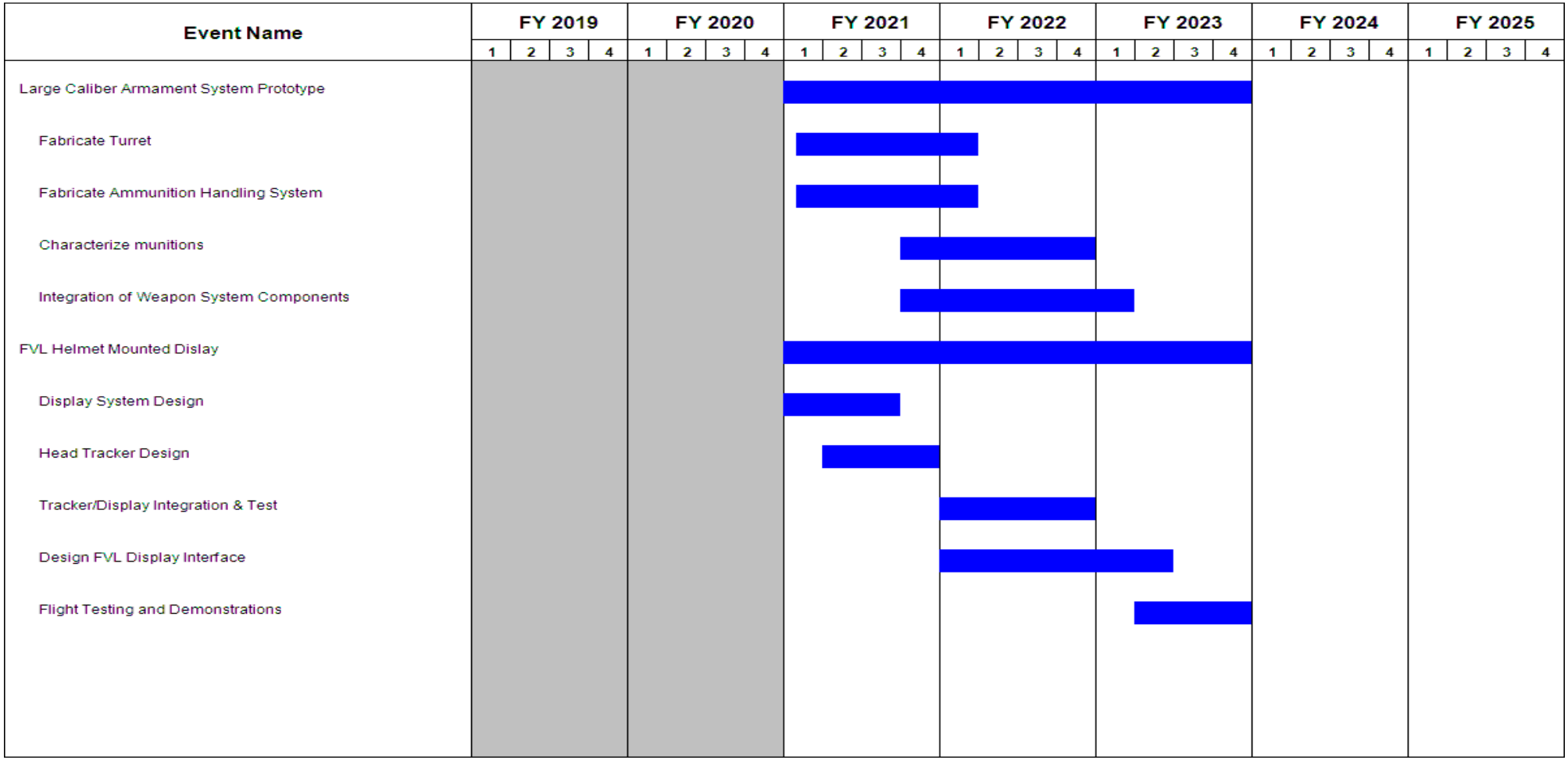

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX3 / *Technology Maturation Initiatives*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Large Caliber Armament System Prototype	1	2021	4	2023
Fabricate Turret	1	2021	1	2022
Fabricate Ammunition Handling System	1	2021	1	2022
Characterize munitions	4	2021	4	2022
Integration of Weapon System Components	4	2021	1	2023
FVL Helmet Mounted Dislay	1	2021	4	2023
Display System Design	1	2021	3	2021
Head Tracker Design	2	2021	4	2021
Tracker/Display Integration & Test	1	2022	4	2022
Design FVL Display Interface	1	2022	2	2023
Flight Testing and Demonstrations	2	2023	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX4 / *Computational Prototyping Environment (CPE)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX4: *Computational Prototyping Environment (CPE)*	-	0.000	3.966	5.421	-	5.421	6.912	0.000	0.000	0.000	0.000	16.299
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0604115A Technology Maturation Initiatives
* Project DS3 Technology Maturation Initiatives

A. Mission Description and Budget Item Justification

This Project funds the development and demonstration of a robust Virtual Proving Ground (VPG) for rapid, accurate, and computational prototyping of major Army platforms. Computation Prototyping Environment (CPE) provides the ability to validate platform design variations in a VPG, in a way that identifies potential performance and design failures, and assesses mitigating solutions and trades prior to cost-bearing production and manufacturing. Activities under this Project include the maturation and integration of physics-based, computational modeling with new advances in deep learning in order to provide the ability to virtually explore design tradespaces and understand possible defeat strategies. This Project leverages recent Department of Defense (DOD) advancements in large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high-performance computing capabilities, and inverse modeling approaches to enable rapid computational prototyping to inform emerging acquisition programs.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Funding has been realigned to reflect the FY20 financial restructure and Army Modernization Priorities.

Work in this Project is performed by the Engineer Research and Development Center (ERDC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Computational Prototyping Environment (CPE)	-	3.923	5.421
Description: This effort matures and integrates physics-based, computational modeling with new advances in deep learning in order to demonstrate a robust VPG that provides the ability to virtually explore design tradespaces and understand possible defeat strategies for prototype Army platforms. Demonstrates rapid computational prototyping to inform emerging acquisition programs through large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high-performance computing capabilities, and inverse modeling approaches. CAT capabilities will be piloted to support and inform Army Future Vertical Lift (FVL) platform designs.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will integrate physical test data from Future Vertical Lift platforms into prototype VPG to validate computational models. Will leverage DOD high-performance computing to begin integration of artificial intelligence and machine learning algorithms into VPG. Develop framework for incorporating environmental and mission relevant data to virtual proving ground. Develop data repository for physical test data, computational models, and operation environments. ***FY 2021 Plans:*** Will continue to develop data repository for physical test data, computational models, and operational environments linked to High Performance Computing environment; improve the FVL VPG to model candidate Future Attack Reconnaissance Aircraft (FARA) designs during maneuver and improve the VPG to include different operationally relevant environmental conditions; improve machine learning techniques to drive engineering analysis of FVL systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.043	-
Accomplishments/Planned Programs Subtotals	-	3.966	5.421

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX4 / *Computational Prototyping Environment (CPE)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.043		-		-		-	0.000	0.043	-
		Subtotal	-	-		0.043		-		-		-	0.000	0.043	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Computational Prototyping Environment	C/Various	ERDC : Vicksburg, MS	-	-		3.923		5.421		-		5.421	6.918	16.262	-
		Subtotal	-	-		3.923		5.421		-		5.421	6.918	16.262	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		3.966		5.421		-		5.421	6.918	16.305	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

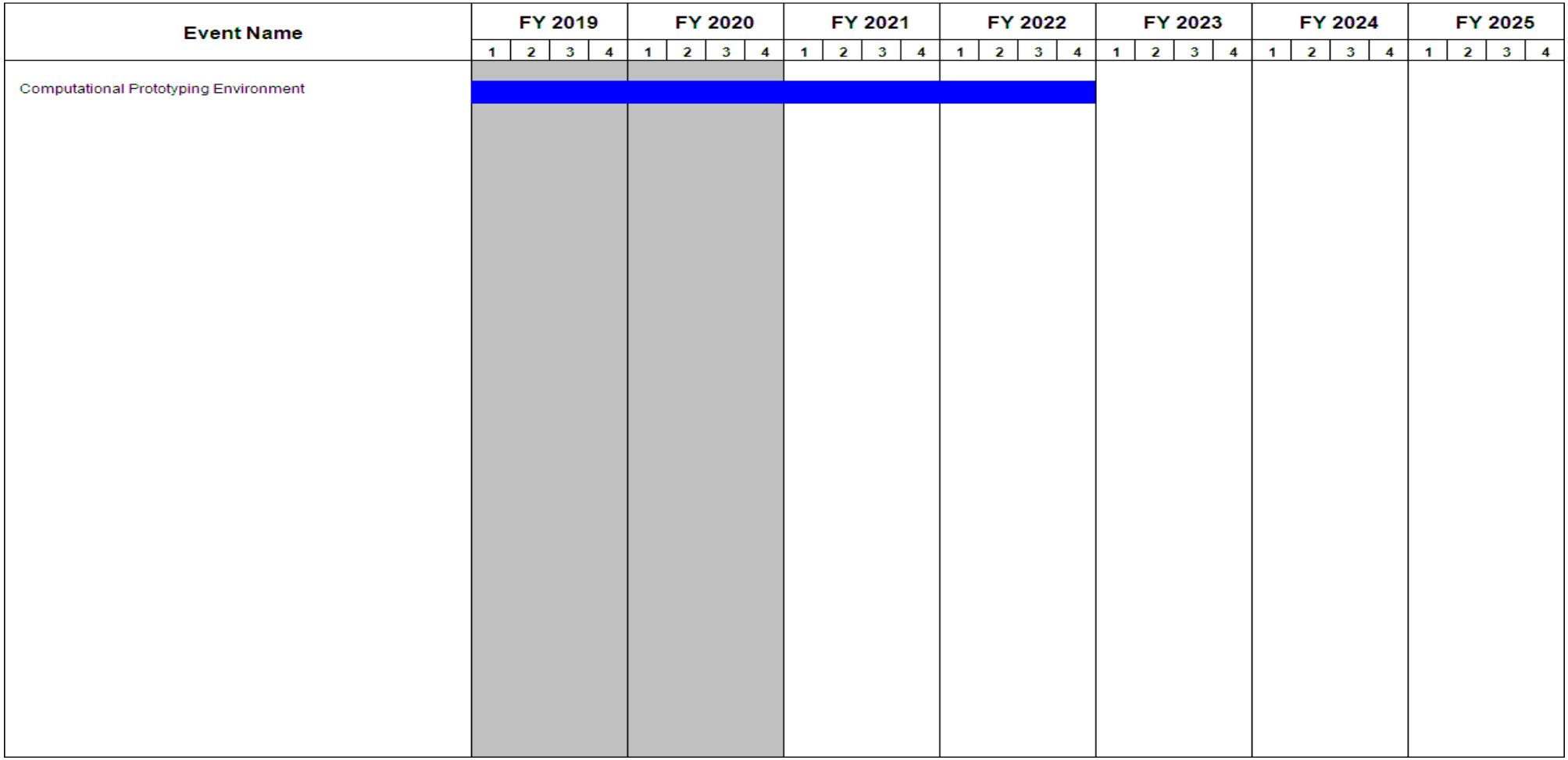

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Computational Prototyping Environment	3	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX5 / *Next Generation Close Combat Missile*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX5: *Next Generation Close Combat Missile*	-	0.000	9.000	4.995	-	4.995	0.000	0.000	0.000	0.000	0.000	13.995
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0604115A Technology Maturation Initiatives
* Project DS3 Technology Maturation Initiatives

A. Mission Description and Budget Item Justification

This Project demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight. Activities mature proof-of-principle hardware into an integrated tactical-representative design, and demonstrate a prototype missile with lethality overmatch of emerging threats. Early prototyping work concludes in Fiscal Year 2021 (FY21) to mature technology and demonstrate needed Warfighter capability in advance of acquisition program of record.

Work in this PE complements PE 0603462A (Next Generation Combat Vehicle Advanced Technology.

Funding has been realigned to reflect the FY20 financial restructure and Army Modernization Priorities.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Next Generation Close Combat Missile	-	9.000	4.995
Description: This effort demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight.			
FY 2020 Plans: Will optimize, integrate, and conduct experimental testing of the prototype propulsion subsystem component hardware (Electro-Mechanical Control Actuation System, Airframe, Launch Motor, and a Boost-Sustain Propulsion Section). Will conduct wind tunnel			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
testing to verify predicted aerodynamic and control surface performance. Will exercise subsystem performance models in an integrated flight simulation and mature flight software. ***FY 2021 Plans:*** Will evaluate performance of propulsion system components, integrated in a tactically-representative missile, through flight demonstration; transition designs, documentation and data to Program Executive Office Missiles and Space. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Accomplishments/Planned Programs Subtotals	-	9.000	4.995

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX5 / *Next Generation Close Combat Missile*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Next Generation Close Combat Missile	Various	AvMC : Huntsville, AL	-	-		9.000		4.995		-		4.995	0.000	13.995	-
		Subtotal	-	-		9.000		4.995		-		4.995	0.000	13.995	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		9.000		4.995		-		4.995	0.000	13.995	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

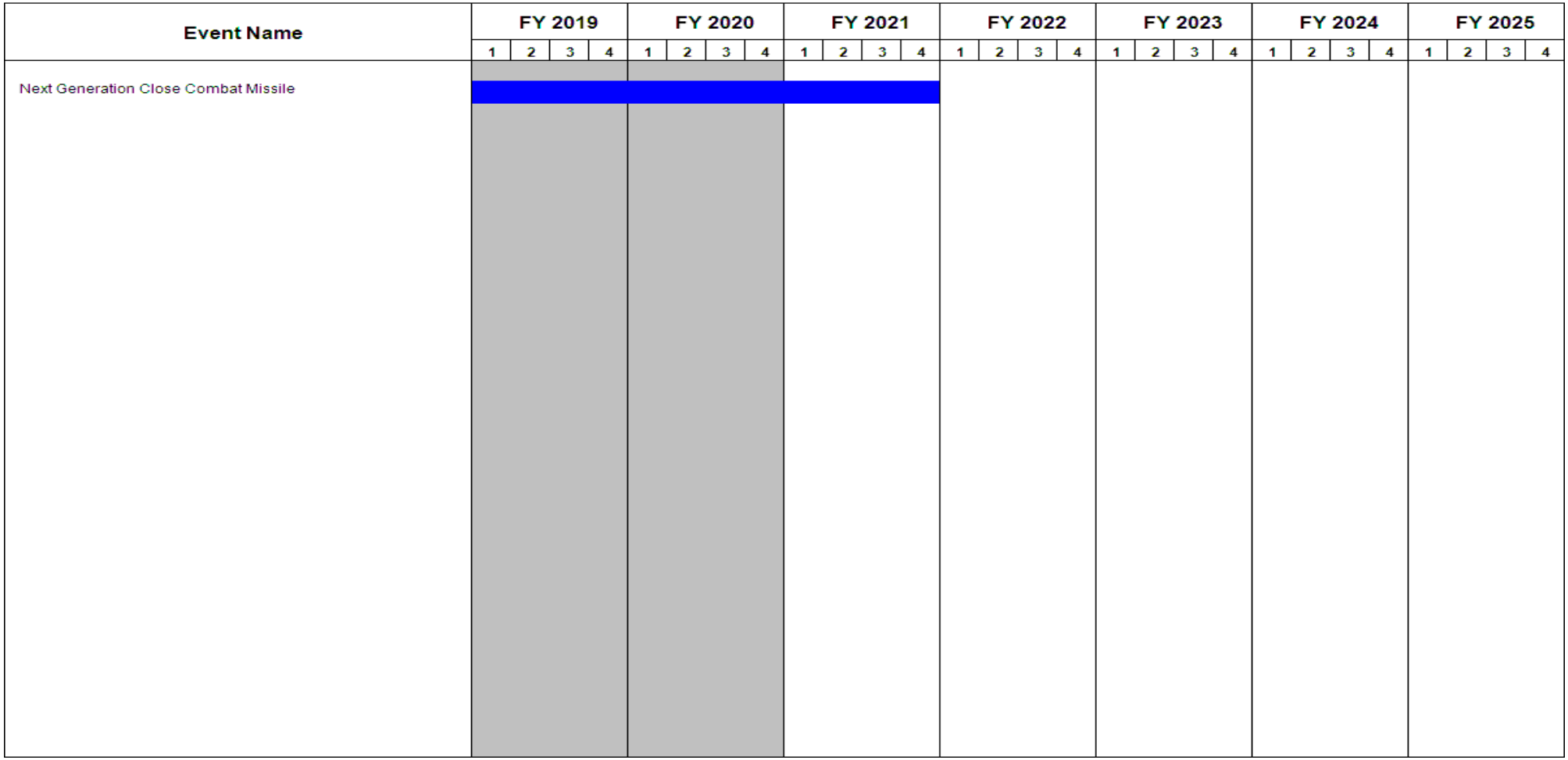

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Next Generation Close Combat Missile	1	2019	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX6 / *Active Protection Systems Integration*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX6: *Active Protection Systems Integration*	-	0.000	7.400	10.490	-	10.490	0.000	0.000	0.000	0.000	0.000	17.890
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0604115A Technology Maturation Initiatives
* Project DS3 Technology Maturation Initiatives

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates protection and survivability technologies as part of active protection systems (APS) prototyping for the Army's combat vehicles. Activities integrate complimentary survivability technologies to enable layers of enhanced protection capability, providing greater survivability against current and emerging advanced threats. This Project demonstrates a suite of technologies on a fielded combat vehicle platform using an APS common architecture, and defines component interface standards and specifications that enable adaptive APS solutions. Activities support the Army's APS strategy to maintain or reduce vehicle weight by reducing reliance on armor with other means such as sensing, warning, hostile fire detection, and active countermeasures.

Work in this Project is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and transitions to PE 0604852A (Suite of Vehicle Protection Systems - EMD).

Funding has been realigned to reflect the FY20 financial restructure and Army Modernization Priorities.

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 by the United States (U.S.) Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Agile Layered Protection: APS Integration Advanced Technology Demonstrator	-	7.400	10.490
Description: Activities integrate and demonstrate mature APS technologies layered through a common architecture on an Army ground combat vehicle platform, addressing technical and integration challenges for a system designed to address both current and emerging advanced threats. Selects and integrates mature component technologies that are best suited to optimize added capability for the ATD platform. Demonstrates a suite of APS technologies and effects that optimize performance levels			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
for survivability and protection through advanced threat detection, multiple threat defeat systems, and improved situational awareness. ***FY 2020 Plans:*** Will continue to integrate selected APS technologies onto the combat vehicle platform demonstrator. Will validate the integrated APS system function on the demonstrator, and test and evaluate the platform vehicle to ensure the added suite of technologies does not introduce unintended degraded performance to the vehicle?s mission. Upon completion of testing, results will inform vehicle Product Manager?s acquisition planning for the APS protection suite. Will continue the vehicle protection layering approach and select additional (mature) APS component technologies for integration, offering incremental improvement options for protection and survivability for the vehicle platform. ***FY 2021 Plans:*** Will continue maturing the combat vehicle protection layering approach, integrating additional protection and survivability capabilities based on selection of mature technologies in FY20; optimize, design, and demonstrate integration of selected protection technologies on the combat vehicle platform demonstrator to validate integration; test the combat vehicle platform demonstrator to ensure the added technologies do not degrade the vehicle?s or previously tested technologies? performance. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Accomplishments/Planned Programs Subtotals	-	7.400	10.490

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX6 / *Active Protection Systems Integration*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineer Integration of APS Layered Protection	C/Various	Various : Various	-	-		4.400		-		-		-	0.000	4.400	-
Validation of APS Layered Protection	Various	Various : Various	-	-		2.000		-		-		-	0.000	2.000	-
Integration of added APS Layered Protection	C/Various	Various : Various	-	-		1.000		4.990		-		4.990	0.000	5.990	-
Validation of added APS Layered Protection	C/Various	AFC : Warren, MI	-	-		-		5.500		-		5.500	0.000	5.500	-
		Subtotal	-	-		7.400		10.490		-		10.490	0.000	17.890	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		7.400		10.490		-		10.490	0.000	17.890	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

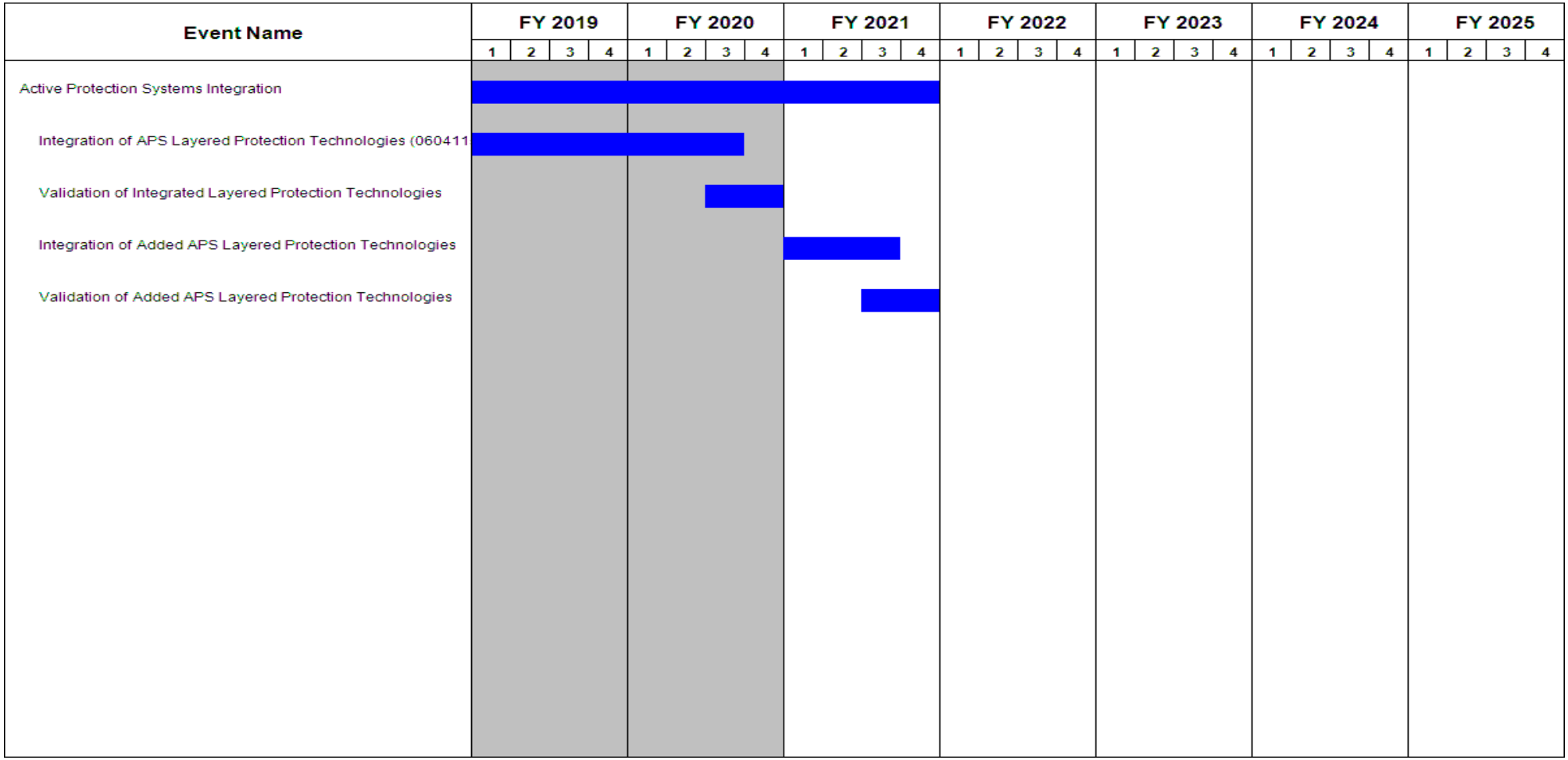

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Active Protection Systems Integration	1	2019	4	2021
Integration of APS Layered Protection Technologies (0604115A, DS3 in FY 2019)	1	2019	3	2020
Validation of Integrated Layered Protection Technologies	3	2020	4	2020
Integration of Added APS Layered Protection Technologies	1	2021	3	2021
Validation of Added APS Layered Protection Technologies	3	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX7: *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	-	0.000	18.650	8.142	-	8.142	0.000	0.000	0.000	0.000	0.000	26.792
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY2021.

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0604115A Technology Maturation Initiatives
* Project DS3 Technology Maturation Initiatives

A. Mission Description and Budget Item Justification

This Project matures and demonstrates an integrated a 50 kilowatt (kW)-class laser weapon system into a Stryker platform, providing a system-level, High Energy Laser (HEL) experimental prototype for demonstration in realistic operating environments. These demonstrations will inform requirements, decrease risk for future Army HEL acquisition programs, and support the future development of warfighter Tactics/Techniques/Procedures and Concept of Operations. HEL weapon systems are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems and without the need to stockpile ordnance. A 50 kW-class laser weapon system has the potential to engage and defeat rockets, artillery, mortars (RAM); unmanned aerial vehicles (UAVs); sensors; and optics for maneuvering Brigade Combat Teams (BCTs). Demonstrations will also inform potential future capability to defeat both fixed- and rotary-wing manned aircraft. Leveraging Government investments and Industry technology advancements, will review and select existing HEL subsystem designs for integration into a Stryker combat vehicle; will conduct integration and demonstration of a system-level HEL experimental prototype; and will provide assessment of technical performance in an operational environment. This effort informs application of laser weapons to other combat platforms and rapid prototyping to units-of-action to meet emerging threats expressed in the National Defense Strategy.

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

Work in this Project is performed by the Rapid Capabilities and Critical Technologies Office (RCCTO).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	-	17.804	8.142
Description: This effort matures, integrates, and demonstrates HEL technologies on Army Stryker vehicles to inform Maneuver-Short Range Air Defense (M-SHORAD) requirements and reduce risk for M-SHORAD. The goal is to protect maneuvering forces from RAM and Unmanned Aerial System (UAS) threats.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Will complete procurement and integration of system hardware; will complete evaluation of subsystems against performance parameters; will continue integrating initial firing doctrine as well as Battle Management, Communications, Command, Control, Computer, and Intelligence software; will begin planning technology readiness level 7 demonstration, procure targets for the demonstration; and begin the system level test/fix/test process of MMHEL. ***FY 2021 Plans:*** Will complete integration of system hardware, weapon fire control software, Forward Area Air Defense Command and Control (FAADC2), and Intelligence software; conduct full system level test/fix/test process; system verification and acceptance testing; prepare for and execute a technology readiness level 7 demonstration; and prepare for and execute system performance testing to inform Capability Developer?s requirement, Concept of Operations (CONOPS) and training development. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.846	-
Accomplishments/Planned Programs Subtotals	-	18.650	8.142

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.846		-		-		-	0.000	0.846	-
		Subtotal	-	-		0.846		-		-		-	0.000	0.846	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	C/Various	SMDTC : Huntsville, AL	-	-		17.804		8.142		-		8.142	0.000	25.946	-
		Subtotal	-	-		17.804		8.142		-		8.142	0.000	25.946	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		18.650		8.142		-		8.142	0.000	26.792	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

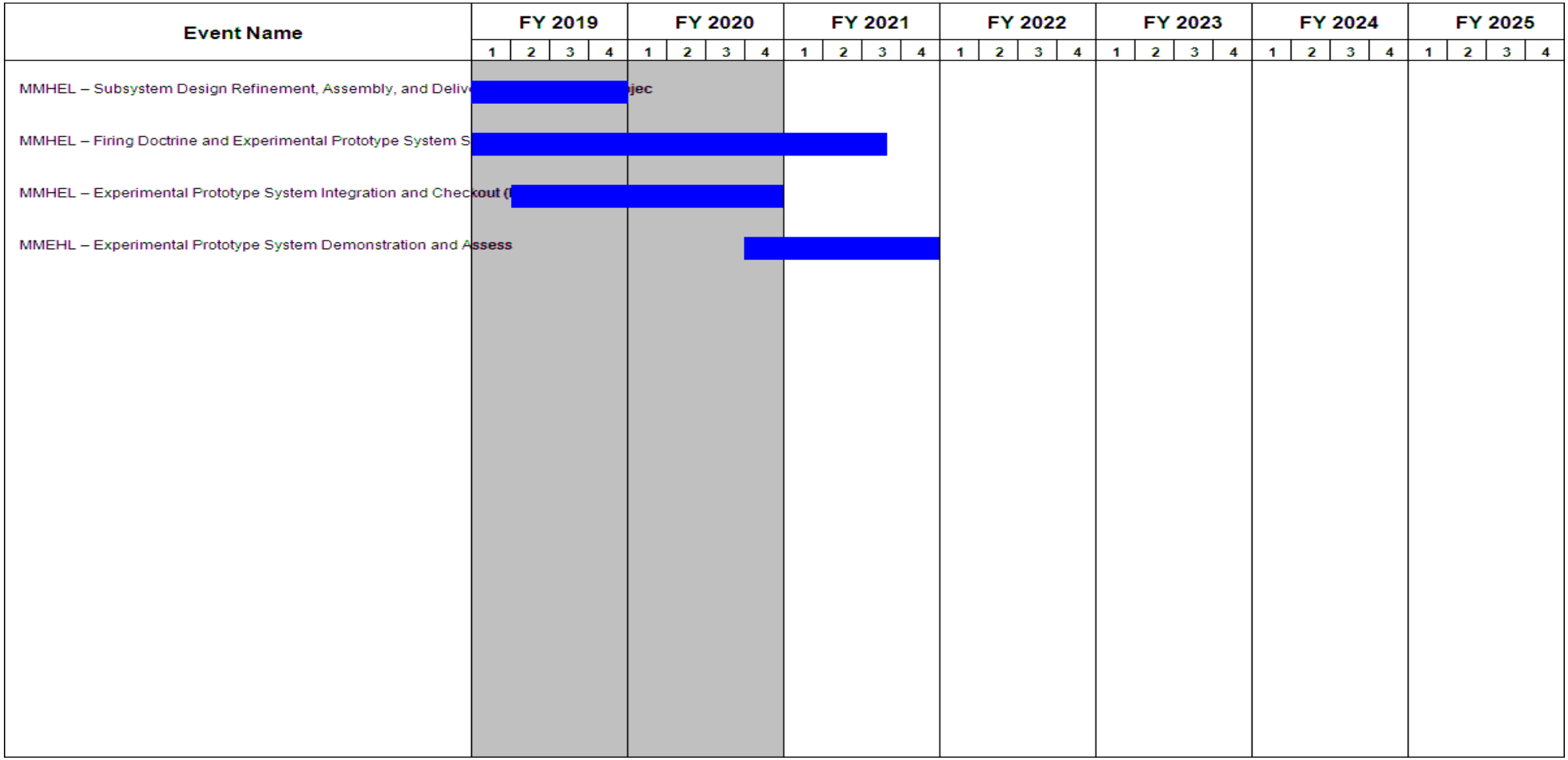

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Multi-Mission High Energy Laser (MMHEL) ? System-Level Design (PE 0604115A, Proj	3	2018	4	2018
MMHEL ? Subsystem Design Refinement, Assembly, and Delivery (PE 0604115A, Projec	4	2018	4	2019
MMHEL ? Firing Doctrine and Experimental Prototype System Software (PE 0604115A	1	2019	3	2021
MMHEL ? Experimental Prototype System Integration and Checkout (PE 0604115A, Pro	2	2019	4	2020
MMEHL ? Experimental Prototype System Demonstration and Assess	4	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX8: *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	-	0.000	27.200	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.200
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0604115 Technology Maturation Initiatives
* Project DS3 Technology Maturation Initiatives

This Project completes in FY20.

A. Mission Description and Budget Item Justification

This Project matures and integrates next-generation 50mm weapon system technologies transitioned from under the Advanced Lethality and Accuracy System for Medium Caliber (ALAS-MC) advanced technology development effort into a vehicle-agnostic combat turret to inform requirements for the Next Generation Combat Vehicle (NGCV). This Project integrates and assesses critical ALAS-MC 50mm technology components for on-the-move engagement of moving personnel and materiel targets, bringing the subsystem to Technology Readiness Level (TRL) 7. Under Advanced Targeting and Lethality Automated System (ATLAS), this Project matures and integrates advanced Artificial Intelligence/Machine Learning (AI/ML) algorithms to enable aided target detection/recognition capability for NGCV using next generation, multi-spectral electro-optical and infrared (EO/IR) targeting sensors. AI/ML algorithms are integrated with real-time intelligent fire control and mission planning interfaces to demonstrate automated turret capabilities, and provide overmatch via reduced target acquisition and engagement timelines.

Work in this Project is related to and fully integrated with the efforts funded in PE 0603462A (Next Generation Combat Vehicle Advanced Technology) / Project BF5 (Adv Lethality & Accuracy Sys for Med Cal Adv Tech); and Project BG1 (Sensors for Auto Oper and Survivability Adv Tech.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Advanced Lethality and Accuracy System for Med Cal (ALAS-MC)	-	5.000	-
Description: This effort matures and integrates the next generation 50mm weapon system technologies transitioned from the ALAS-MC advanced technology development effort into vehicle- agnostic combat turret to inform requirements for the Next Generation Combat Vehicle.			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Will mature next generation 50mm armament and fire control systems to TRL 7 by integrating and assessing 50mm component technologies for on-the-move engagement of moving personnel and materiel targets. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** ALAS-MC effort completes in FY20.			
Title: Advanced Targeting and Lethality Automated System (ATLAS) ***Description:*** The ATLAS effort matures, integrates, and demonstrates novel algorithms and sensor enhancements in a Next Generation Combat Vehicle (NGCV) vehicle agnostic, robotic turret. It integrates autonomous, wide-area search sensors and gimballed targeting sensors with real-time computer aided detection, recognition, and identification of threats for significantly decreased time to engagement. It integrates target acquisition with intelligent fire control system to demonstrate an end-to-end engagement system on NGCV platforms, and enable experimentation and soldier touch-points with robotic turret concepts. ***FY 2020 Plans:*** Will mature synthetic, augmented, and real threat data sets to train and test automated target recognition (ATR) algorithms in a variety of complex, cluttered environments. Will execute initial demonstration of advanced targeting sensors with embedded ATR processing in a relevant test environment using a stationary vehicle. Will develop and demonstrate sensor and algorithm integration approaches with intelligent fire control systems. Synthetic imagery development and data collections will inform on-the-move target detection and recognition algorithms for a wider variety of environments. Will develop and mature moving and stationary target indicators. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** ATLAS effort completes in FY20.	-	20.965	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.235	-
Accomplishments/Planned Programs Subtotals	-	27.200	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX8 / *Adv Leth and Accuracy Sys for Med Caliber (ALAS-MC)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.235		-		-		-	0.000	1.235	-
		Subtotal	-	-		1.235		-		-		-	0.000	1.235	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALAS-MC: Procure Ammo Rounds H/W	C/Various	ARDEC : Picatinny, NJ	-	-		3.700		-		-		-	0.000	3.700	-
ALAS-MC: Control Unit	C/Various	ARDEC : Picatinny, NJ	-	-		0.300		-		-		-	0.000	0.300	-
ALAS-MC: Test Hardware	TBD	ARDEC : Picatinny, NJ	-	-		0.200		-		-		-	0.000	0.200	-
ATLAS: System Design	TBD	CERDEC : Fort Belvoir, VA	-	-		5.000		-		-		-	0.000	5.000	-
ATLAS: Artificial Intelligence/Machine Learning Development	TBD	CERDEC : Fort Belvoir, VA	-	-		6.500		-		-		-	0.000	6.500	-
ATLAS: Data Collection and Synthetic Data	TBD	CERDEC : Fort Belvoir, VA	-	-		8.065		-		-		-	0.000	8.065	-
ATLAS: Integration and Test	TBD	CERDEC : Fort Belvoir, VA	-	-		1.400		-		-		-	0.000	1.400	-
		Subtotal	-	-		25.165		-		-		-	0.000	25.165	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALAS-MC	TBD	ARDEC : Picatinny, NJ	-	-		0.800		-		-		-	0.000	0.800	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	-	-		0.800		-		-		-	0.000	0.800	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		27.200		-		-		-	0.000	27.200	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

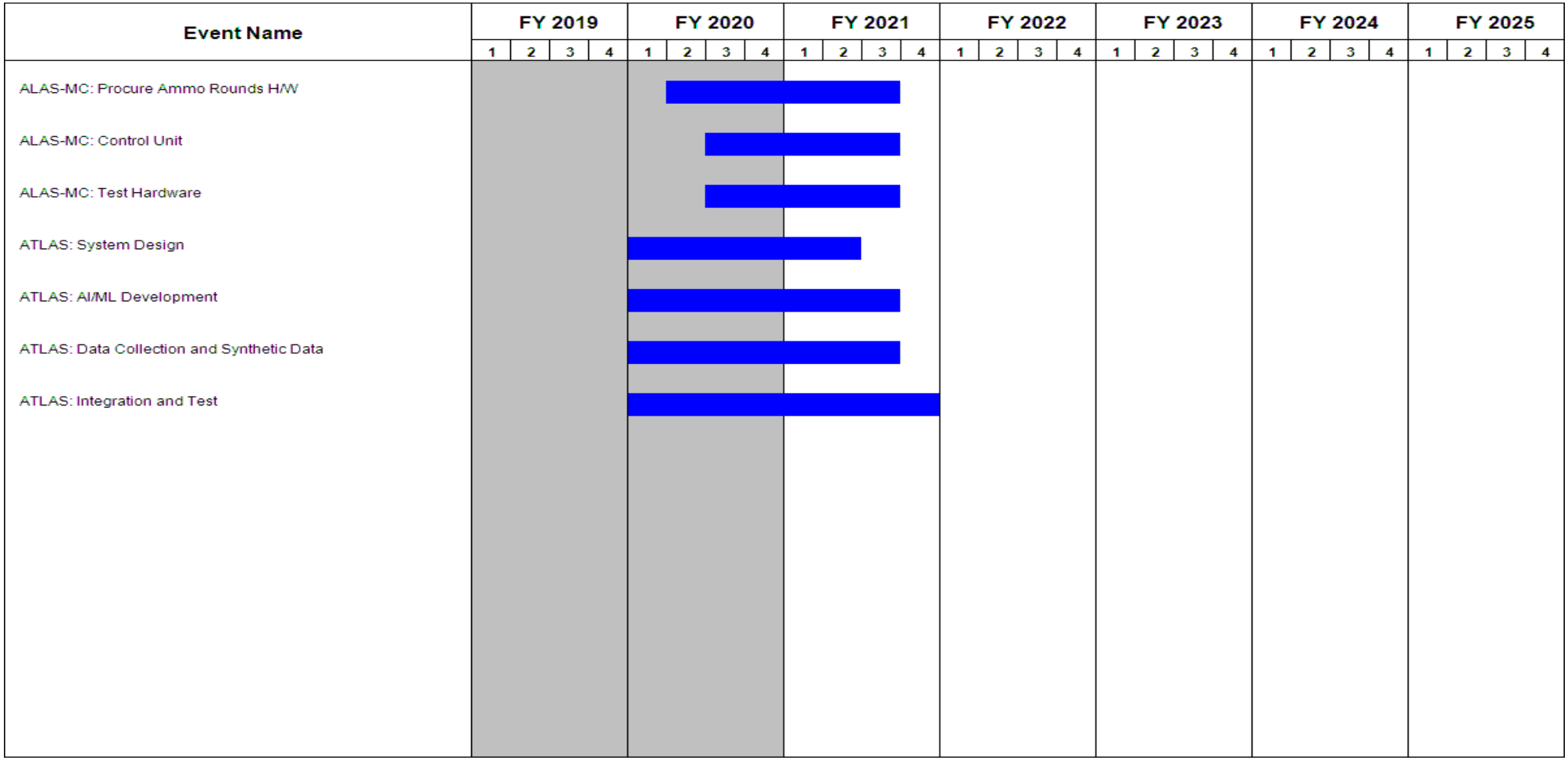

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
ALAS-MC: Procure Ammo Rounds H/W	2	2020	3	2021
ALAS-MC: Control Unit	3	2020	3	2021
ALAS-MC: Test Hardware	3	2020	3	2021
ATLAS: System Design	1	2020	2	2021
ATLAS: AI/ML Development	1	2020	3	2021
ATLAS: Data Collection and Synthetic Data	1	2020	3	2021
ATLAS: Integration and Test	1	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX9 / *Adv Mobility Experimental Prototype Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AX9: *Adv Mobility Experimental Prototype Adv Tech*	-	0.000	10.500	15.785	-	15.785	10.490	7.193	0.000	0.000	0.000	43.968
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project integrates and demonstrates advanced powertrain, power generation, and running gear technologies into a prototype ground combat vehicle. Advanced Mobility Experimental Prototype activities will demonstrate increased mobility, increased maneuver speeds, reduced fuel demands, and onboard power generation available for advanced lethality and protection technologies. The experimental prototype will be evaluated in realistic operating environment to validate performance and capability enhancements to inform ground combat vehicle programs of record.

This work is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) / BG4 (Adv Mobility Experimental Prototype Adv Tech Demo).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Advanced Mobility Experimental Prototype	-	10.023	15.785
Description: Efforts integrate and demonstrate advanced powertrain, power generation, running gear technologies, and unmanned robotic technologies into a ground combat vehicle to demonstrate reduced percentage of no-go terrain for ground vehicles, increased maneuver speeds across all traversable terrain, reduced fuel demands thus extending operation time between resupply, and onboard power generation to enable the integration of energy based capabilities such as directed energy weapons and electromagnetic armor. This effort mitigates risk for the Self-Propelled Howitzer.			
FY 2020 Plans: Will fabricate powertrain, power generation, and running gear technologies. Will develop designs for integration onto a surrogate combat vehicle platform, minimizing modifications to surrogate structure. Will develop and mature air induction/filtration, exhaust system, fuel cooling, final drives, and controls.			
FY 2021 Plans: Will continue to develop and mature air induction/filtration, exhaust system, fuel cooling, final drives, and controls to integrate into experimental prototype; integrate higher capacity engine and transmission as well as improved track and suspension into a			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
medium weight-class combat vehicle; demonstrate operational benefits of leader follower autonomous capability for unmanned combat vehicle formations. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.477	-
Accomplishments/Planned Programs Subtotals	-	10.500	15.785

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX9 / *Adv Mobility Experimental Prototype Adv Tech*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.477		-		-		-	0.000	0.477	-
		Subtotal	-	-		0.477		-		-		-	0.000	0.477	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Design and Integration of Components	C/Various	GVSC : Warren, MI	-	-		0.900		6.100		-		6.100	5.000	12.000	-
Develop air handling, cooling system, final drives & controls	C/Various	GVSC : Warren, MI	-	-		2.900		-		-		-	0.000	2.900	-
Fabricate Powertrain Technologies	C/Various	GVSC : Warren, MI	-	-		3.400		-		-		-	0.000	3.400	-
Fabricate Advanced Running Gear	C/Various	GVSC : Warren, MI	-	-		2.400		-		-		-	0.000	2.400	-
Design Integration for Surrogate Platform	C/Various	GVSC : Warren, MI	-	-		0.423		-		-		-	0.000	0.423	-
Component Fabrication	TBD	GVSC : Warren, MI	-	-		-		7.155		-		7.155	7.700	14.855	-
Capability Demonstration	TBD	GVSC : Warren, MI	-	-		-		2.530		-		2.530	5.000	7.530	-
		Subtotal	-	-		10.023		15.785		-		15.785	17.700	43.508	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		10.500		15.785		-		15.785	17.700	43.985	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

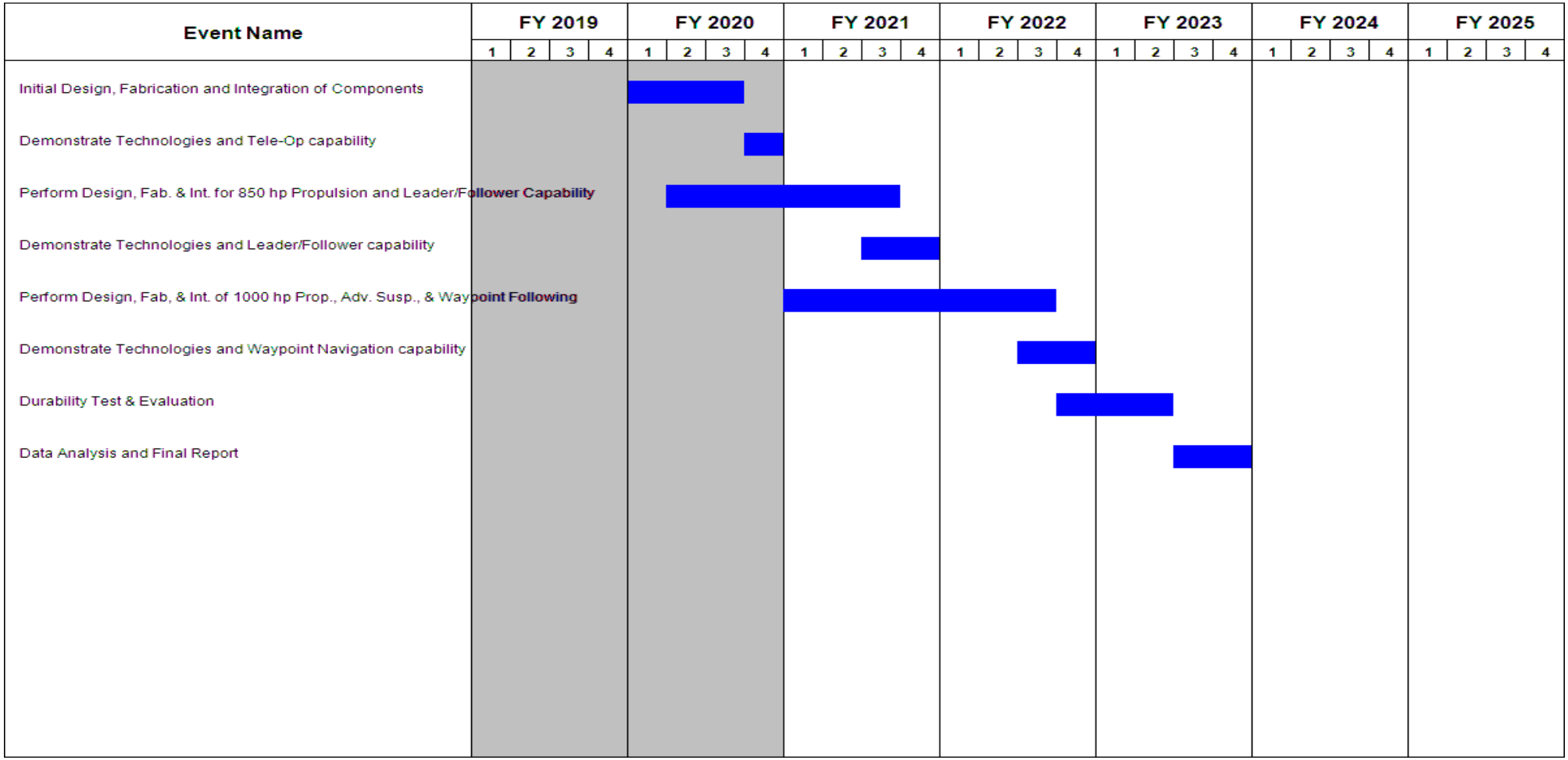

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Initial Design, Fabrication and Integration of Components	1	2020	3	2020
Demonstrate Technologies and Tele-Op capability	4	2020	4	2020
Perform Design, Fab. & Int. for 850 hp Propulsion and Leader/Follower Capability	2	2020	3	2021
Demonstrate Technologies and Leader/Follower capability	3	2021	4	2021
Perform Design, Fab, & Int. of 1000 hp Prop., Adv. Susp., & Waypoint Following	1	2021	3	2022
Demonstrate Technologies and Waypoint Navigation capability	3	2022	4	2022
Durability Test & Evaluation	4	2022	2	2023
Data Analysis and Final Report	3	2023	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY1 / *MUM-T Platform Enabler*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AY1: *MUM-T Platform Enabler*	-	0.000	7.200	4.496	-	4.496	4.196	0.000	0.000	0.000	0.000	15.892
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate Manned Unmanned Teaming (MUMT) technologies in a realistic operating environment to drive down risk in three critical areas for ground MUMT: remote lethality, unmanned maneuver and network. These major technical hurdles will be addressed by integrating mature technologies into the MUMT Campaign of Learning through three, synergistic integration efforts: Unmanned Aerial Vehicle (UAV)/ground platform integration, a transportable MUMT simulation environment, and an advanced interface for the Warfighter.

Work within this Project supports the Army Modernization Priority for Next Generation Combat Vehicle.

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

Work in this Project is performed by the United States (U.S.) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Unmanned Aerial Vehicle / Ground Platform Integration	-	3.886	4.496
Description: This effort matures and demonstrates in an operational environment technologies that address critical capability challenges related to the integration of UAVs and ground vehicle platforms. This effort also improves human-machine interactions through an intuitive Warfighter Machine Interface (WMI) between operators and unmanned platforms. The end state is to analyze the operational impact of multiple advanced enabling technologies to reduce risk in critical capabilities that support MUMT operations.			
FY 2020 Plans: Will conduct task and workflow analysis for the integration of electro-optic sensors, a communications repeater, and advanced WMI to improve situational awareness and network communications. Will select baseline platforms for the ground and aerial vehicles. Will mature the demonstrator technology by optimizing subsystem performance during hardware and software integration on the vehicle platform. Will conduct engineering demonstration of integrated technologies to validate approach prior to operational demonstrations.			
FY 2021 Plans: Will mature the required subsystems based on lessons learned from engineering demonstration and standardize interfaces for UAV to ground platform integration using simulators developed in FY20; conduct operational demonstrations with users to			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
evaluate the effectiveness of the integrated solution against their operational needs, shape future engineering work, and inform requirements development. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This increase is to focus on UAV capabilities work in FY 2021.			
Title: Transportable Manned Unmanned Teaming Simulation ***Description:*** This effort provides an immersive, transportable MUMT simulation environment in order to gather insights from diverse user groups to shape and inform MUMT Tactics, Techniques and Procedures (TTPs). Specifically, it provides the capability to optimize Warfighter Machine Interface (WMI) implementations and advanced payloads for multiple MUMT scenarios. The end state is to provide Soldiers across the fighting echelon, from command to end user, the requisite knowledge to formulate the appropriate Concept of Operations (CONOPS) 7.200 for MUMT in order to operate and fight disbursed against near-peer adversaries with greater lethality and force projection. ***FY 2020 Plans:*** Will design and begin development of a realistic, transportable simulator to virtually assess the control vehicle layout under various conditions and modes. Will mature the simulation environment and associated technologies in preparation for user virtual assessments to shape and inform MUMT TTPs. Will develop scenarios for virtual simulation that will engage the user base on software improvements to the WMI. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease is due to the completion of the transportable simulators work in FY20. These simulators will be used to facilitate integration of standard user interfaces for unmanned platforms under the 'Unmanned Aerial Vehicle (UAV) / Ground Platform Integration' bullet for the remainder of this project.	-	2.987	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.327	-
Accomplishments/Planned Programs Subtotals	-	7.200	4.496

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.327		-		-		-	0.000	0.327	-
		Subtotal	-	-		0.327		-		-		-	0.000	0.327	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UAV / Ground Platform Integration	C/Various	TARDEC : Warren, MI	-	-		3.886		4.496		-		4.496	4.200	12.582	-
Transportable Simulator	C/Various	TARDEC : Warren, MI	-	-		2.987		-		-		-	0.000	2.987	-
		Subtotal	-	-		6.873		4.496		-		4.496	4.200	15.569	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		7.200		4.496		-		4.496	4.200	15.896	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

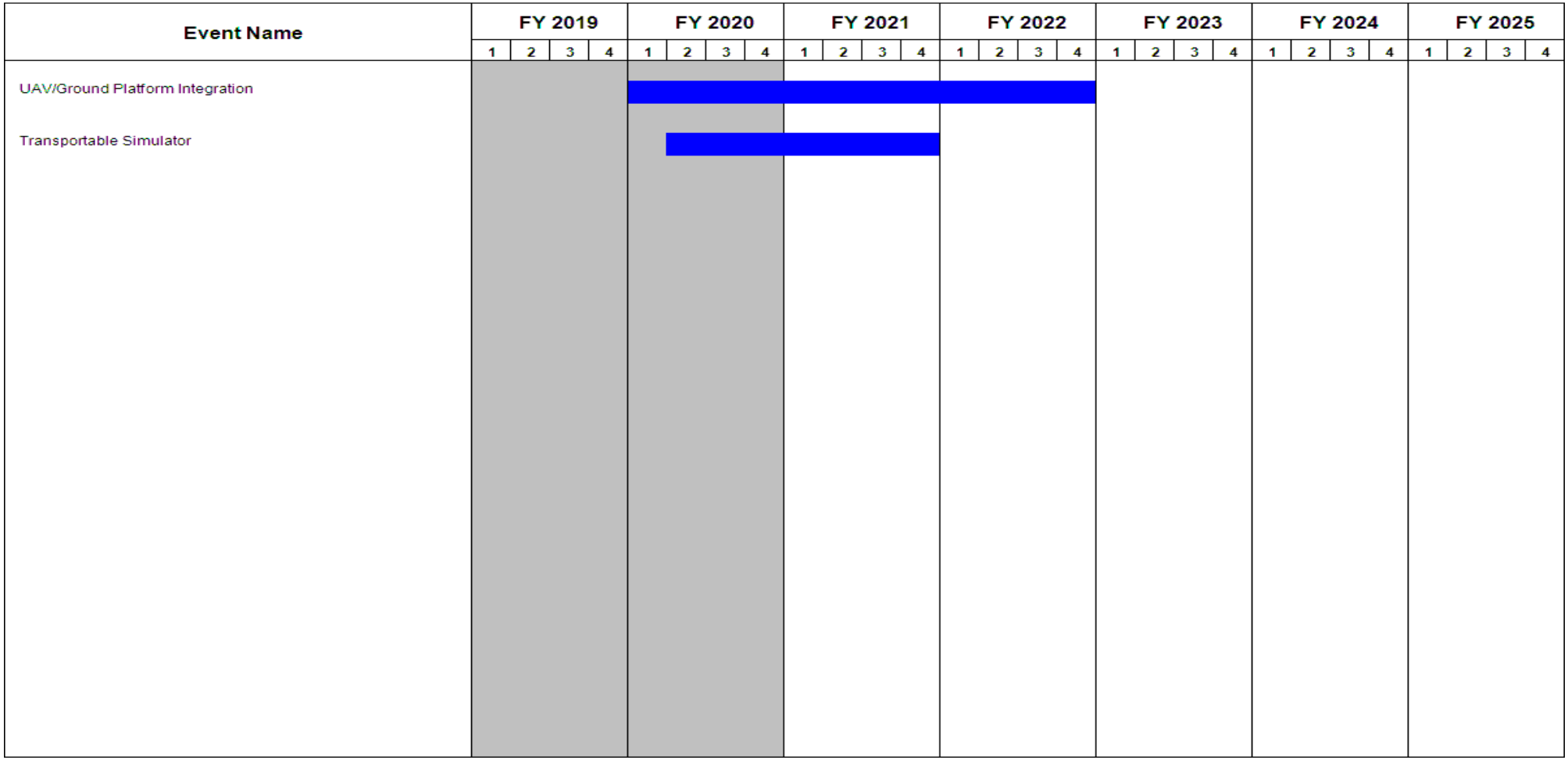

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
UAV/Ground Platform Integration	1	2020	4	2022
Transportable Simulator	2	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY2 / *Army Operational Fires*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AY2: *Army Operational Fires*	-	0.000	18.900	28.372	-	28.372	38.336	10.790	0.000	0.000	0.000	96.398
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a ground-launched, treaty-compliant weapon system capable of destroying critical relocatable, time sensitive targets in contested Anti-Access/Area Denied (A2/AD) environments. Activities include system-level prototyping to extend the range of Army fires well beyond 499km to complement other fires developments.

Work in this Project complements PE 0603464A (Long Range Precision Fires 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.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Army Operational Fires	-	18.042	28.372
Description: This effort matures and demonstrates a ground-launched, treaty-compliant weapon system capable of destroying critical relocatable, time sensitive targets in contested A2/AD environments. ***FY 2020 Plans:*** Will develop system architecture and interfaces; will initiate fire control software development; and perform sub-system testing and evaluation of solid rocket booster and launch platform hardware. ***FY 2021 Plans:*** Will mature fire control software development and launch platform hardware development; conduct end to end propulsion system integration and testing of developed propulsion booster system; and conduct system level critical design review (CDR) in preparation for final flight test hardware fabrication. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Title: FY 2020 SBIR/STTR Transfer	-	0.858	-
Description: Funding transferred in accordance with Title 15 USC ?638			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	18.900	28.372

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY2 / *Army Operational Fires*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.858		-		-		-	0.000	0.858	-
		Subtotal	-	-		0.858		-		-		-	0.000	0.858	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Operational Fires	C/Various	AvMC : Huntsville, AL	-	-		18.042		28.372		-		28.372	52.700	99.114	-
		Subtotal	-	-		18.042		28.372		-		28.372	52.700	99.114	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		18.900		28.372		-		28.372	52.700	99.972	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

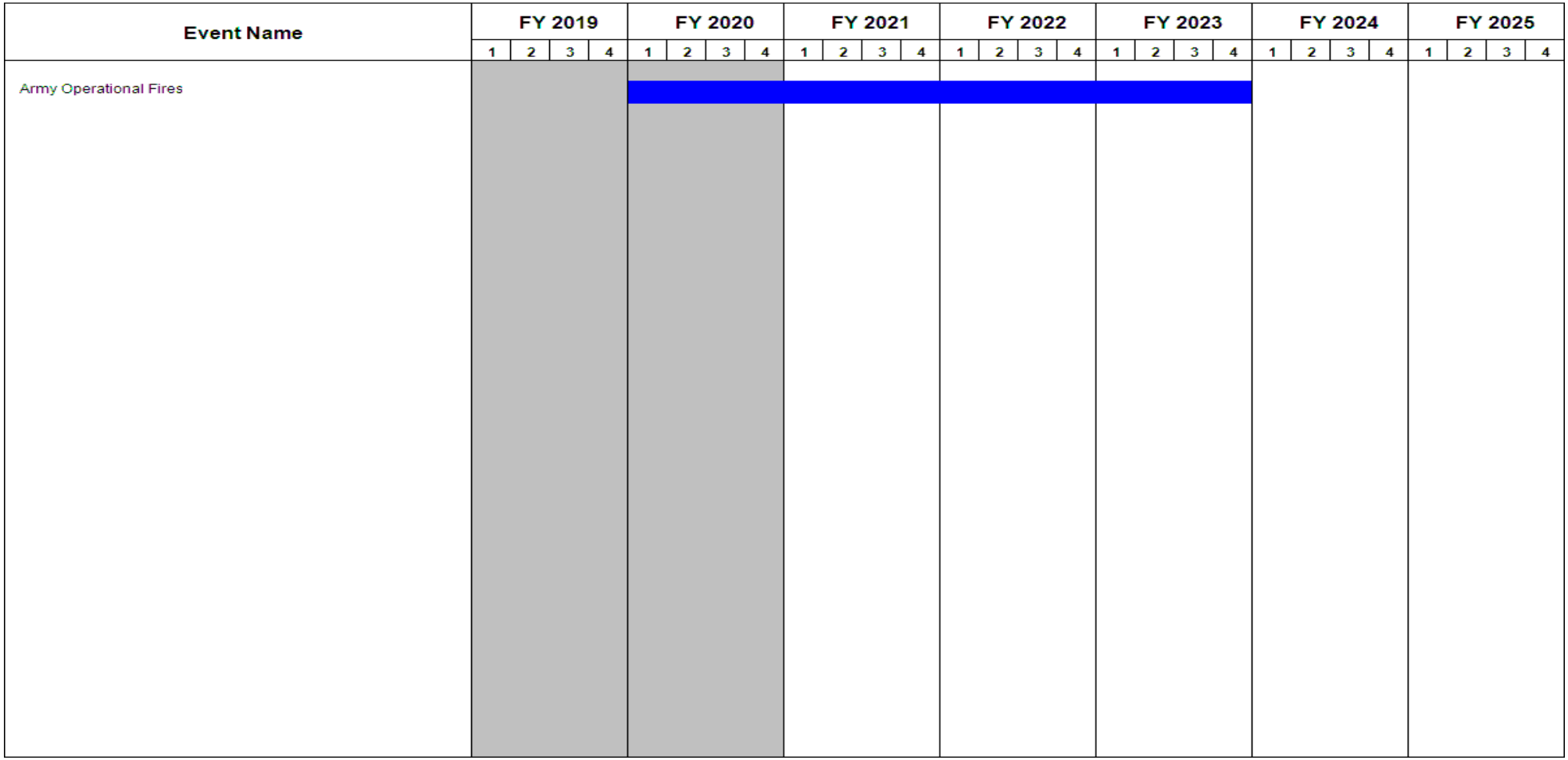

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Army Operational Fires	1	2020	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY3 / *Strategic Long Range Cannon*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
AY3: *Strategic Long Range Cannon*	-	0.000	76.860	65.147	-	65.147	70.933	0.000	0.000	0.000	0.000	212.940
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and integrates long-range armament technologies for both weapons and munitions to demonstrate potential deep strike objective capabilities from future cannon artillery systems. It will demonstrate revolutionary performance to support Long Range Fires by further developing, integrating, and demonstrating enhanced lethality and range extension solutions for cannon system performance with maximum effects. Strategic Long Range Cannon (SLRC) activities include integrating component technologies into sub-system and system-level experimental prototypes for novel cannon, munition, and fire control, including guidance and propulsion.

Extended Range Cannon Artillery (ERCA) activities mature, integrate, and demonstrate a novel sub-system for ammunition handling and a long-range artillery projectile to support prototyping and experimentation of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight.
The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the Unites States (U.S.) Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Strategic Long Range Cannon	-	60.696	65.147
Description: This effort will integrate and prototype subsystem technologies to further enhance range, lethality, and precision enablers for extended range cannon and munition systems.			
FY 2020 Plans: Will scale up cannon and projectile technology components and fabricate sub-system prototype hardware leveraging activities and information gained under 0603464A (Long Range Precision Fires Advanced Technology) / Project AE6 (Strategic Long Range Cannon Advanced Technology). Will integrate test hardware and conduct subsystem testing and experimentation.			
FY 2021 Plans: Will mature critical sub-system technologies with major engineering tests on high risk components such as the rocket motor; will conduct static warhead testing to demonstrate performance against targets of interest; will conduct system integration			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
and technology maturation for SLRC to include designs for long lead prototypes to be used in upcoming major system level demonstrations; will scale and perform prototyping on components including objective cannon, gun carriage, and test platform. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Planned program progression.			
Title: Extended Range Cannon Artillery Autoloader ***Description:*** This effort matures, integrates, and demonstrates a novel technology sub-system prototype for ammunition handling to support the prototyping of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight. ***FY 2020 Plans:*** Will mature and integrate ammunition handling automation technologies into a sub-system prototype for demonstration and validation of performance. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** ERCA Autoloader effort ends after FY20.	-	9.837	-
Title: Extended Range Cannon Artillery Projectile ***Description:*** This effort integrates component technologies that provide optimized range, precision, counter-measure, and payload into a long-range artillery projectile sub-system for demonstration and experimentation. Activities support the maturation and prototyping of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight. ***FY 2020 Plans:*** Will mature and integrate enabling component technologies into long-range artillery projectile sub-system. Will demonstrate and validate increased range, sensor optimization and integration, and improved performance for armor and counter-battery defeat at extended ranges in contested and Global Positioning Satellite (GPS)-denied environments. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** ERCA Projectile effort ends after FY20.	-	2.837	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	3.490	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	76.860	65.147

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY3 / *Strategic Long Range Cannon*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		3.490		-		-		-	0.000	3.490	-
		Subtotal	-	-		3.490		-		-		-	0.000	3.490	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Strategic Long Range Cannon	C/Various	ARDEC : Picatinny, NJ	-	-		60.696		65.147		-		65.147	71.000	196.843	-
Extended Range Cannon Artillery (ERCA) Autoloader	C/Various	ARDEC : Picatinny, NJ	-	-		9.837		-		-		-	0.000	9.837	-
Extended Range Cannon Artillery (ERCA) Projectile	C/Various	ARDEC : Picatinny, NJ	-	-		2.837		-		-		-	0.000	2.837	-
		Subtotal	-	-		73.370		65.147		-		65.147	71.000	209.517	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Man-Portable Air Defense System (MANPADS) Experiment	Option/ Various	PEO M&S, PM Cruise MIssile Defense System : Huntsville, AL	-	-		-		0.000		-		0.000	-	-	-
		Subtotal	-	-		-		0.000		-		0.000	-	-	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		76.860		65.147		-		65.147	71.000	213.007	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY3 / *Strategic Long Range Cannon*	

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

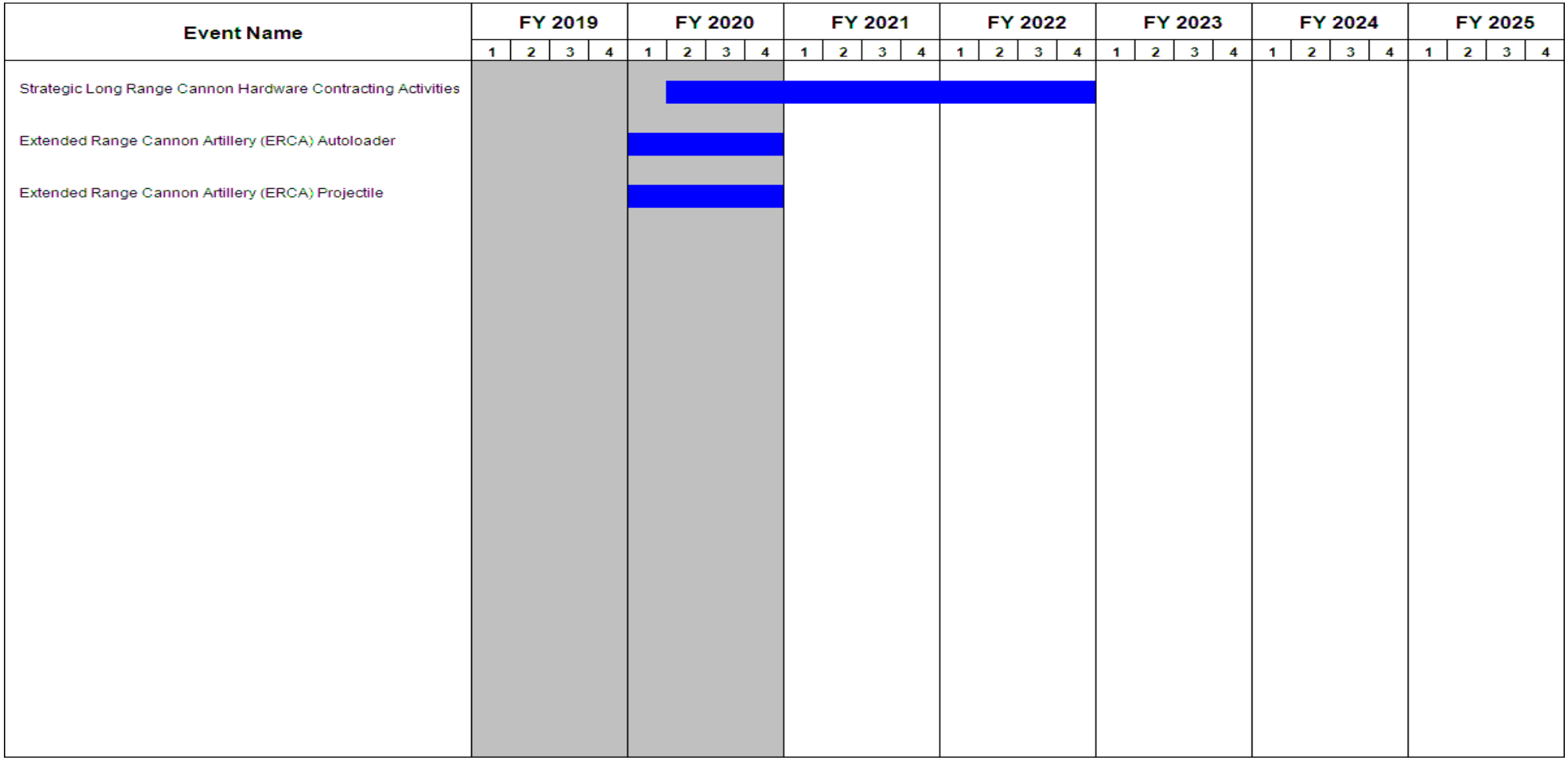

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Strategic Long Range Cannon Hardware Contracting Activities	2	2020	4	2022
Extended Range Cannon Artillery (ERCA) Autoloader	1	2020	4	2020
Extended Range Cannon Artillery (ERCA) Projectile	1	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*				Project (Number/Name) DS3 / *Technology Maturation Initiatives*			
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
DS3: *Technology Maturation Initiatives*	-	91.749	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	91.749
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Beginning in Fiscal Year (FY) 2020, Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives) has been realigned to:
PE 0604115A Technology Maturation Initiatives:
* Project AX3 Technology Maturation Initiatives
* Project AX4 Computational Prototyping Environment (CPE)
* Project AX5 Next Generation Close Combat Missile
* Project AX6 Active Protection Systems Integration
* Project AX7 Multi-Mission High Energy Laser (MMHEL) Sys Demo
* Project AX8 Adv Leth and Accuracy Sys for Med Calber ALAS-MC
* Project AX9 Adv Mobility Experimental Prototype Adv Tech
* Project AY1 MUM-T Platform Enabler
* Project AY2 Army Operational Fires
* Project AY3 Strategic Long Range Cannon

A. Mission Description and Budget Item Justification

This Project funds the maturation, integration, and demonstration of advanced technology demonstrators and experimental prototypes to support advanced ground systems; aviation systems; command, control, communication & reconnaissance systems and equipment; precision weapons, High Energy Laser (HEL) systems; and Soldier equipment. Technology Maturation Initiative (TMI) efforts mature and integrate component technologies into early system and sub-system experimental prototypes for demonstration in relevant environments and tactical/operational scenarios, taking technologies to a goal of Technology Readiness Level (TRL) 7. Technology demonstrators and experimental prototypes are validated and transitioned to priority Army experimentation and acquisition efforts to inform requirements for future programs of record and reduce the risk of technology insertion. These efforts are typically 2-4 years in duration, and are approved by Army senior leadership based on priority and opportunity, to ensure that demonstrations have high potential for filling capability gaps and transitioning. Activities include the maturation, integration, and demonstration of HEL prototype weapons performance on a combat platform in realistic operational environments in support of the Army's objective capability for Maneuver-Short Range Air Defense (M-SHORAD). A 50 kilowatt (kW)-class laser weapon system has the potential to engage and defeat rockets, artillery, mortars (RAM), unmanned aerial systems(UASs), sensors, and optics for maneuvering brigade combat teams (BCTs). Activities also include sub-system prototyping and integration of leap-ahead ground combat vehicle powertrain technologies; and integration and demonstration of key Active Protection System (APS) components to provide modular and layered vehicle protection effects (hard-kill and soft-kill), enabling power projection and enhanced survivability. Computational Prototyping Environment (CPE) efforts include demonstration of physics-based, computational modeling integrated with new advances in deep learning to explore

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

design tradespaces and understand defeat strategies for prototype platforms. This Project provides the Army with an improved mechanism for enabling greater competition in the latter stages of technology maturation and establishing a closer alignment between Science and Technology (S&T) efforts and acquisition programs.

The cited work is consistent with the Under Secretary of Defense, Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the 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).

Funding has been realigned to reflect the FY20 financial restructure and Army Modernization Priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Vehicle Survivability Subsystem Demonstrator ***Description:*** The Vehicle Survivability Subsystem effort integrates and demonstrates cost effective, lightweight designs for the optimization of hull, frame, body, cab and armor technologies to achieve survivability systems weight reductions of 10-15% and increased vehicle survivability against advanced and emerging threats.	7.373	-	-
Title: Advanced Powertrain Subsystem Demonstrator ***Description:*** The Advanced Powertrain Subsystem Demonstrator effort fabricates, integrates, and demonstrates next generation, scalable combat vehicle powertrain technologies into a high power dense and more fuel efficient combat vehicle powertrain. This powertrain will demonstrate advancements in engine and transmission subsystem components specific for military platforms in order to provide an integrated advanced propulsion system .	10.612	-	-
Title: Active Protection Systems Integration and Demonstration ***Description:*** This effort synchronizes emerging S&T products with the Vehicle Protection Suite (VPS) Program of Record and matures key APS technologies to a Technology Readiness Level 7 for integration onto current and future ground platforms. It matures Modular Active Protection Framework (MAF)-compliant effectors and sensors, and integrates them onto ground combat vehicles for prototype system test and demonstration. It conducts independent evaluation to inform system development processes that ensure safety compliance for future VPS increment upgrades as new threats emerge.	7.416	-	-
Title: Multi-Mission High Energy Laser (MMHEL) ***Description:*** This effort matures and integrates a 50 kW-class laser system into a Stryker platform, providing a system-level, HEL experimental prototype for demonstration in realistic operating environments. These demonstrations will inform requirements, decrease risk for future Army HEL acquisition programs, and support the future development of warfighter Tactics/Techniques/ Procedures (TTPs) and Concept of Operations (CONOPS). HEL weapon systems are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems and without the need to stockpile ordnance. A 50 kW-class laser weapon system has the potential to engage and defeat RAM; Unmanned Aerial Vehicles (UAVs); sensors;	54.658	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
and optics for maneuvering BCTs. Demonstrations will also inform potential future capability to defeat both fixed- and rotary-wing manned aircraft. Leveraging Government investments and Industry technology advancements, will review and select existing HEL subsystem designs for integration into a Stryker vehicle; will conduct integration and demonstration of a system-level HEL experimental prototype; and will provide assessment of technical performance in an operational environment.			
Title: Next Generation Close Combat Missile ***Description:*** The Next Generation Close Combat Missile (NG CCM) effort demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight. Activities mature proof-of-principle hardware into an integrated tactical-representative design and demonstrate a prototype missile with lethality overmatch of emerging threats to address near-term Warfighter needs, in advance of acquisition program of record.	9.430	-	-
Title: Computational Prototyping Environment ***Description:*** The CPE effort creates an integrated, robust, and verified system that leverages recent Department of Defense advancements in large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high performance computing capabilities, and inverse modeling approaches. The CPE demonstrates the early developmental verification and validation of selected weapons platform variations in a way that accurately identifies potential performance and design failures, while also testing and mitigating solutions and multiple trades in a Virtual Proving Ground (VPG) prior to cost-bearing production and manufacturing. CPE efforts facilitate rapid, accurate, and computational prototyping in a robust VPG for early performance verification of new capabilities.	2.241	-	-
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun ***Description:*** FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.019	-	-
Accomplishments/Planned Programs Subtotals	91.749	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Activities are conducted both in-house and through competitively awarded contracts using best value source selection procedures. Multiple competitive contracts will be awarded. The Other Transaction Agreement (OTA) # W15QKN-14-9-1001 Initiative (Task Order) DOTC-16-01-INIT-0302 will be the primary contract vehicle for the MMHEL effort.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) DS3 / *Technology Maturation Initiatives*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2018 NDAA SEC 825 MDAP Cost Overrun	Allot	N/A : N/A	-	0.019		-		-		-		-	0.000	0.019	-
		Subtotal	-	0.019		-		-		-		-	0.000	0.019	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Vehicle Survivability Subsystem Demonstrator	C/Various	Various : Various	21.814	7.373		-		-		-		-	0.000	29.187	-
Advanced Powertrain Subsystem Demonstrator	C/Various	Various : Various	26.945	10.612		-		-		-		-	0.000	37.557	-
Modular Active Protection Systems (MAPS) Demonstrations	C/Various	Various : Various	29.714	-		-		-		-		-	0.000	29.714	-
Active Protection Systems (APS) Integration	C/Various	Various : Various	-	7.416		-		-		-		-	0.000	7.416	-
Multi-Mission High Energy Laser (MMHEL)	C/Various	Various : Huntsville, AL	78.684	54.658		-		-		-		-	0.000	133.342	-
MMHEL Integration and Demonstration (CA)	C/Various	Various : Huntsville, AL	35.000	-		-		-		-		-	0.000	35.000	-
Computational Prototyping Environment	C/Various	Various : Various	1.000	2.241		-		-		-		-	0.000	3.241	-
Next Generation Close Combat Missile	C/Various	Various : Various	-	9.430		-		-		-		-	0.000	9.430	-
		Subtotal	193.157	91.730		-		-		-		-	0.000	284.887	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	193.157	91.749		0.000		-		-		-	0.000	284.906	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) DS3 / *Technology Maturation Initiatives*	

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

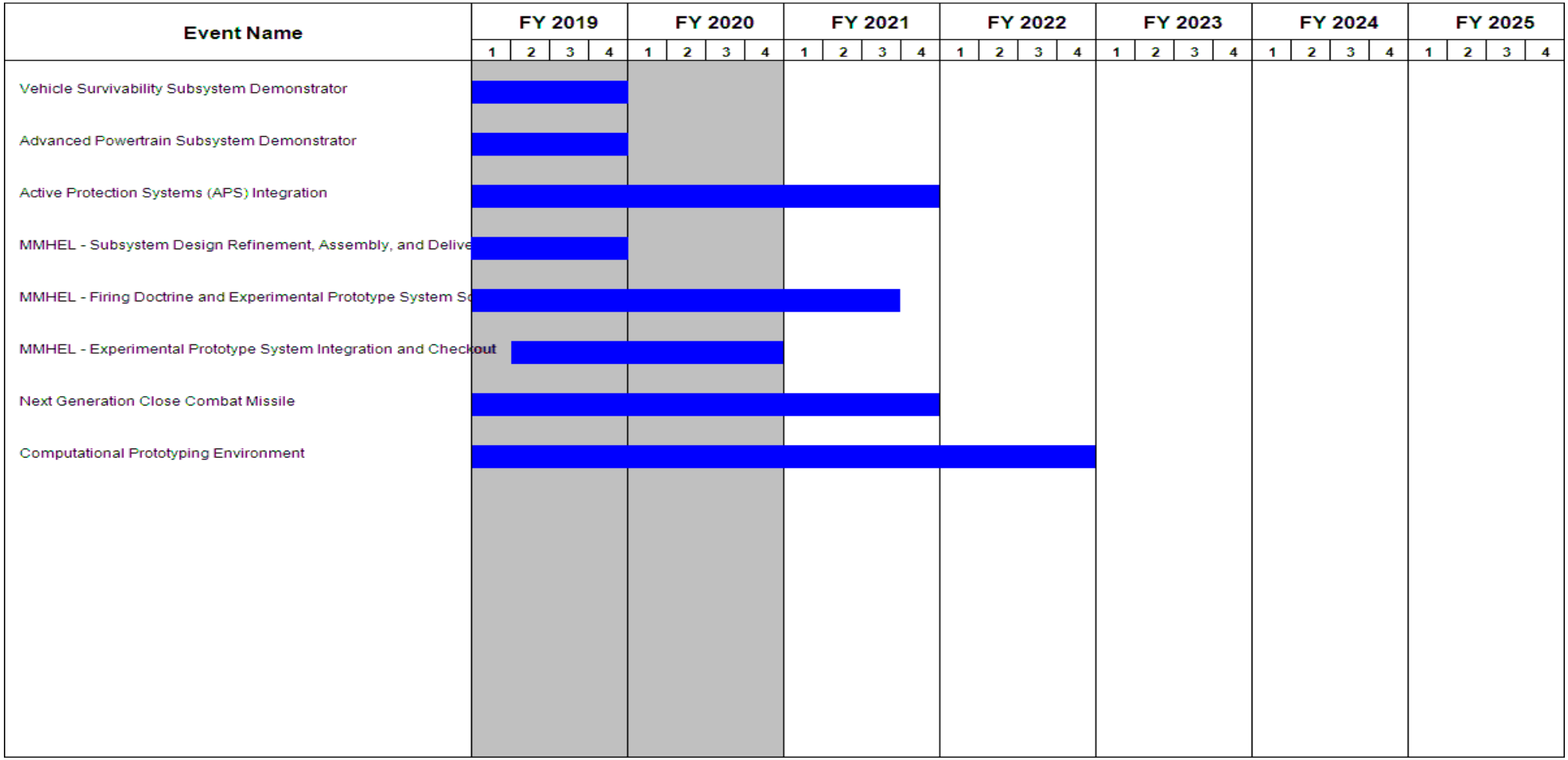

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Vehicle Survivability Subsystem Demonstrator	1	2017	4	2019
Advanced Powertrain Subsystem Demonstrator	1	2017	4	2019
Modular Active Protection Systems (MAPS) Demonstrations	1	2017	4	2018
Active Protection Systems (APS) Integration	1	2019	4	2021
Multi-Mission High Energy Laser (MMHEL) - System-Level Design	1	2018	3	2018
MMHEL - Subsystem Design Refinement, Assembly, and Delivery	4	2018	4	2019
MMHEL - Firing Doctrine and Experimental Prototype System Software	1	2019	3	2021
MMHEL - Experimental Prototype System Integration and Checkout	2	2019	4	2020
Next Generation Close Combat Missile	1	2019	4	2021
Computational Prototyping Environment	1	2018	4	2022

Note

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604117A *I Maneuver - Short Range Air Defense (M-SHORAD)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	75.711	42.900	4.995	-	4.995	39.863	271.946	308.415	446.026	Continuing	Continuing
FI4: *Maneuver - Short Range Air Defense (M-SHORAD)*	-	75.711	42.900	4.995	-	4.995	39.863	271.946	308.415	446.026	Continuing	Continuing

A. Mission Description and Budget Item Justification

Maneuver - Short Range Air Defense (M-SHORAD) is an Air Defense weapon system consisting of multiple ground-to-air missile launchers, sensors and a gun on a Stryker A1 combat vehicle. M-SHORAD provides the Army improved capabilities for defense of maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require the improved M-SHORAD air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aircraft Systems (UAS) and Rocket, Artillery and Mortar (RAM) threats.

The M-SHORAD capability will be provided through a multi-phase approach with a rapidly fielded Initial M-SHORAD system (supported by an Army Approved Directed Requirement) and an enduring M-SHORAD (supported by a Joint Requirements Oversight Council approved Capability Development Document (CDD) that will field the full capability. First, the Army will field the Initial M-SHORAD solution based on a Fiscal Year (FY) 2018 Directed Requirement, which was informed by the FY 2017 M-SHORAD Demonstration. This system will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include FW, RW, and Group 3 UAS while keeping pace and surviving with the maneuver Brigades. The Initial M-SHORAD will be fielded to four M-SHORAD battalions. In addition, the Rapid Capabilities and Critical Technologies Office (RCCTO) will transition the Directed Energy M-SHORAD (DE M-SHORAD) to the M-SHORAD Product Office in 1 Quarter (QTR) FY 2023. DE M-SHORAD will provide the long term capability to counter a broader range of FW, RW, UAS and RAM threats.

FY 2021 to FY 2025 dollars are for the ENDURING M-SHORAD (DE M-SHORAD, Maneuver Air Defense Technologies (MAD-T) missiles and DISMOUNTED M-SHORAD) development. .

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604117A *I Maneuver - Short Range Air Defense (M-SHORAD)*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	79.016	39.100	105.700	-	105.700
Current President's Budget	75.711	42.900	4.995	-	4.995
Total Adjustments	-3.305	3.800	-100.705	-	-100.705
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-9.700			
• Congressional Rescissions	-	-			
• Congressional Adds	-	13.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.305	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-100.705	-	-100.705

Change Summary Explanation

The FY 2021 decrease of $105.7 million was realigned within Air and Missile Defense Portfolio to support Army Modernization of National Defense Strategy to RCCTO for the Directed-Energy M-SHORAD program. $4.995 million was reinstated in FY 2021 to the IM-SHORAD for Completing Operational Assessment Testing into 1 QTR FY 2021 and conducting Enduring M-SHORAD planning.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	Project (Number/Name) FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FI4: *Maneuver - Short Range Air Defense (M-SHORAD)*	-	75.711	42.900	4.995	-	4.995	39.863	271.946	308.415	446.026	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Maneuver - Short Range Air Defense (M-SHORAD) is an Air Defense weapon system consisting of multiple ground-to-air missile launchers, sensors and a gun on a Stryker A1 combat vehicle. M-SHORAD provides the Army improved capabilities for defense of maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require the improved M-SHORAD air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aircraft Systems (UAS) and Rocket, Artillery and Mortar (RAM) threats.

The M-SHORAD capability will be provided through a multi-phase approach with a rapidly fielded Initial M-SHORAD system (supported by an Army Approved Directed Requirement) and an enduring M-SHORAD (supported by a Joint Requirements Oversight Council approved Capability Development Document (CDD) that will field the full capability. First, the Army will field the Initial M-SHORAD solution based on a Fiscal Year (FY) 2018 Directed Requirement, which was informed by the FY 2017 M-SHORAD Demonstration. This system will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include FW, RW, and Group 3 UAS while keeping pace and surviving with the maneuver Brigades. In addition, the Rapid Capabilities and Critical Technologies Office (RCCTO) will transition the Directed Energy M-SHORAD (DE M-SHORAD) to the M-SHORAD Product Office in 1 Quarter (QTR) FY 2023. DE M-SHORAD will provide the long term capability to counter a broader range of FW, RW, UAS and RAM threats.

FY 2021 to FY 2025 dollars are for Enduring M-SHORAD (DE M-SHORAD, Maneuver Air Defense Technologies (MAD-T) missiles and DISMOUNTED M-SHORAD) development.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Initial M-SHORAD Materiel Development/Integration	75.711	41.565	4.995	-	4.995
Description: Develop, test and integrate the Initial M-SHORAD system.					
FY 2020 Plans: - Completed testing to achieve Urgent Materiel Release and Safety Certification - Completed required program documentation - Continued final prototypes					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	**Project (Number/Name)** FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Completed Initial M-SHORAD development effort - Transitioned Multi-Mission High Energy Laser (MMHEL) from Science and Technology (S&T) into the M-SHORAD Program of Record using the Office of the Secretary of Defense (OSD) Manufacturing Technology (ManTech) program ***FY 2021 Base Plans:*** - Complete Operational Assessment Testing of Prototypes units built into 1 QTR FY 2021. - Initial Maneuver Short-Range Air Defense (IM-SHORAD) Urgent Material Release (UMR). - IM-SHORAD First Unit Equipped (FUE). - Conduct Enduring M-SHORAD planning. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding as been adjusted from FY 2020 to FY 2021 to support Directed Energy Development and complete Operational Assessment Testing for the IM-SHORAD prototypes.					
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.335	-	-	-
Accomplishments/Planned Programs Subtotals	75.711	42.900	4.995	-	4.995

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• C14301: *Maneuver - Short Range Air Defense (M-SHORAD)*	-	233.300	378.654	158.300	536.954	330.738	80.412	-	-	Continuing	Continuing

Remarks

M-SHORAD procurement is funded through C14301. This includes Initial M-SHORAD procurement (FY 2020 through FY 2023).

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	**Project (Number/Name)** FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*

D. Acquisition Strategy

The acquisition approach begins with the Initial M-SHORAD. The Initial M-SHORAD uses the FY 2017 M-SHORAD Demonstration as the initial basis to identify near-term initial solutions. The Program Office uses Defense Ordnance Technology Consortium (DOTC) Other Transactional Authority (OTA) agreements for the development and purchase of nine Initial M-SHORAD prototypes according to the content of the Directed Requirement. The OTA efforts include: Mission Equipment Package (MEP) subsystems include Stinger Vehicle Universal Launcher (SVUL), Longbow Missile, EO/IR Sensor, 30 mm Cannon, FAAD-C2, and M240 machine Gun; Platform Integrator effort to procure the Stryker vehicle and integrate the MEP; and the Stinger Launcher.

Program Office will use FY 2021-2025 funds for Enduring M-SHORAD (DE M-SHORAD, MAD-T missiles and DISMOUNTED M-SHORAD) capability. The Program Office plans to award competitive contracts. In FY 2022-2025, the Program will conduct development activities, integration, component qualification, Early Warfighter Assessment, Logistics, and Safety Certifications.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	Project (Number/Name) FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Management	Various	Trident, Intuitive Research and others : Huntsville, Alabama	1.699	2.595	Oct 2018	1.410	Oct 2019	0.995	Oct 2019	-		0.995	0.000	6.699	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.335		-		-		-	0.000	1.335	-
		Subtotal	1.699	2.595		2.745		0.995		-		0.995	0.000	8.034	N/A

Remarks

Conduct Enduring M-SHORAD planning

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Support	MIPR	Combat Capabilites Development Command : Redstone Arsenal, AL	-	1.781	Oct 2018	1.367	Oct 2019	-		-		-	0.000	3.148	-
System Development, Prototypes and Integration	C/CPIF	Defense Ordnance Technology Consortium (DOTC) (DRS Sustainment Systems, General Dynamics Land Systems and Raytheon Missile systems) : Various	64.876	56.676	Oct 2018	13.835	Oct 2019	-		-		-	0.000	135.387	-
Government Furnished Equipment (GFE)	MIPR	Program Executive Officer Missiles and Space : Various	2.374	4.522	Oct 2018	1.183	Oct 2019	-		-		-	0.000	8.079	-
		Subtotal	67.250	62.979		16.385		-		-		-	0.000	146.614	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	Project (Number/Name) FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Systems Development, Prototypes and Integration uses DOTC Other Transactional Authority (OTA) agreements consisting of three separate efforts: Mission Equipment Package (MEP), Platform Integration and Stinger Missile Launcher.
MEP is by DRS Sustainment Systems (St. Louis, MO): $54.008 million FY19 and $6.400 million FY20.
Platform Integration is by General Dynamics Land Systems (Lima, OH and Anniston, AL): $52.182 million FY19 and $6.600 million FY20.
Stinger Missile Launcher is by Raytheon Missile Systems (Tuscon, AZ): $3.881 million FY19 and $2.276 million FY20.

Significant GFE includes M299 Hellfire launchers, FAAD-C2 systems and radios.
M299 launchers are by Lockheed Martin Corp. (Orlando, FL).
FAAD-C2 systems and radios are by Northrop Grumman (Redondo Beach, CA).

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Costs	MIPR	Aviation and Missiles Command (AMCOM) : Redstone Arsenal, AL	0.252	3.460	Oct 2018	1.858	Oct 2019	-		-		-	0.000	5.570	-
		Subtotal	0.252	3.460		1.858		-		-		-	0.000	5.570	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Testing	MIPR	Redstone Test Center (RTC) and White Sands Missile Range (WSMR) : Redstone, AL and WSMR, NM	-	2.448	Oct 2018	11.210	Oct 2019	-		-		-	0.000	13.658	-
Test Support	MIPR	RTC, WSMR, Target Management	-	4.229	Oct 2018	10.702	Oct 2019	4.000	Oct 2020	-		4.000	0.000	18.931	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	Project (Number/Name) FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Office and others : Redstone, AL and WSMR, NM													
		Subtotal	-	6.677		21.912		4.000		-		4.000	0.000	32.589	N/A

Remarks

Complete Operational Assessment Testing 1QTR in FY 2021.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	69.201	75.711		42.900		4.995		-		4.995	0.000	192.807	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	**Project (Number/Name)** FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*

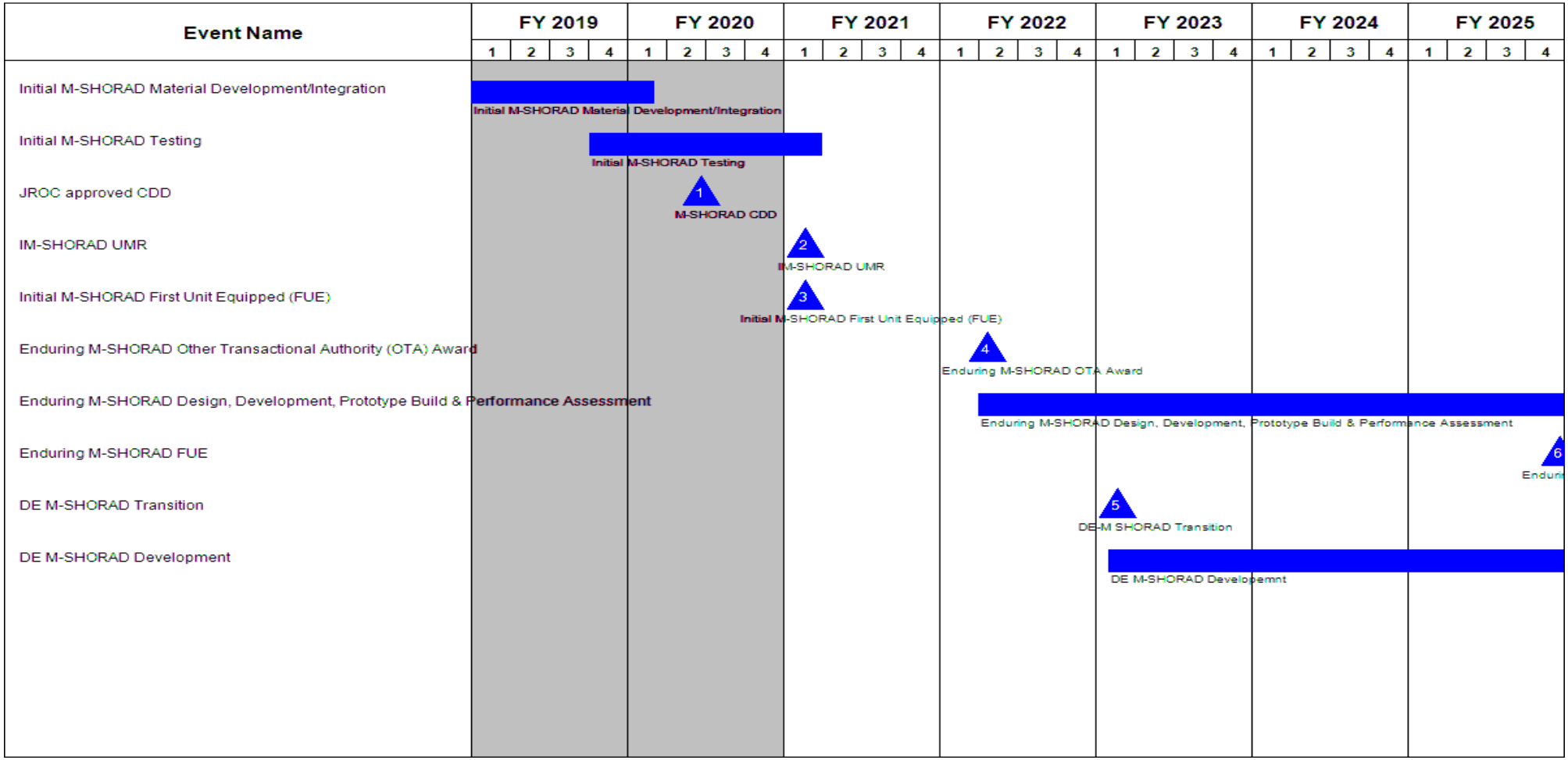

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604117A / *Maneuver - Short Range Air Defense (M-SHORAD)*	**Project (Number/Name)** FI4 / *Maneuver - Short Range Air Defense (M-SHORAD)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Directed Requirement	2	2018	2	2018
Initial M-SHORAD Material Development/Integration	4	2018	1	2020
Initial M-SHORAD Testing	4	2019	1	2021
JROC approved CDD	2	2020	2	2020
IM-SHORAD UMR	1	2021	1	2021
Initial M-SHORAD First Unit Equipped (FUE)	1	2021	1	2021
Enduring M-SHORAD Other Transactional Authority (OTA) Award	2	2022	2	2022
Enduring M-SHORAD Design, Development, Prototype Build & Performance Assessment	2	2022	4	2025
Enduring M-SHORAD FUE	4	2025	4	2025
DE M-SHORAD Transition	1	2023	1	2023
DE M-SHORAD Development	1	2023	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604118A *I TRACTOR BEAM*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	52.894	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.894
XW0: *TRACTOR BEAM*	-	52.894	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.894

A. Mission Description and Budget Item Justification

The details of this program are reported in accordance with Title 10, United States Code, Section 119(a)(1).

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	52.894	0.000	0.000	-	0.000
Current President's Budget	52.894	0.000	0.000	-	0.000
Total Adjustments	0.000	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604119A / *Army Advanced Component Development & Prototyping*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	117.335	170.490	-	170.490	171.933	150.439	154.432	176.584	0.000	941.213
BR2: *Advanced Component Development & Prototyping*	-	0.000	117.335	170.490	-	170.490	171.933	150.439	154.432	176.584	0.000	941.213

A. Mission Description and Budget Item Justification

The Advance Component Development & Prototype budget line includes multiple efforts across the Army's Battlefield Operational Systems necessary to evaluate integrated technologies in the most high fidelity and realistic operating environment as possible to assess the performance or cost reduction potential of advanced technology.

Projects focus on proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Efforts also includes advanced technology demonstrations to expedite technology transition from the laboratory to operational use, with the goal of transitioning systems into the acquisition process within the FYDP.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	119.645	32.150	-	32.150
Current President's Budget	0.000	117.335	170.490	-	170.490
Total Adjustments	0.000	-2.310	138.340	-	138.340
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-2.310			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	138.340	-	138.340

Change Summary Explanation

Increases to the FY 2021 request supports proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Efforts also includes advanced technology demonstrations to expedite technology transition from the laboratory to operational use, with the goal of transitioning systems into the acquisition process within the next five years.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604120A *I Assured Positioning, Navigation and Timing (PNT)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	128.125	-	128.125	66.661	0.000	0.000	0.000	Continuing	Continuing
BV4: *Area Protection and Alt Nav Technology Development*	-	0.000	0.000	18.840	-	18.840	12.181	0.000	0.000	0.000	0.000	31.021
ED5: *Assured Positioning, Navigation and Timing (PNT)*	-	0.000	0.000	27.215	-	27.215	21.454	0.000	0.000	0.000	0.000	48.669
EH8: *DISMOUNTED*	-	0.000	0.000	13.337	-	13.337	12.446	0.000	0.000	0.000	0.000	25.783
EJ2: *MOUNTED*	-	0.000	0.000	68.733	-	68.733	20.580	0.000	0.000	0.000	Continuing	Continuing

Note

Program Element (PE) 0604120A restructured from PE1206120A in FY 2021.

A. Mission Description and Budget Item Justification

Assured Positioning, Navigation and Timing (A-PNT) provides Army ground maneuver forces access to assured PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied (jammed and spoofed). A-PNT products are ruggedized tactical systems that enable Army forces at echelon the ability to shoot, move, communicate, and protect their forces to penetrate and dis-integrate enemy anti-access systems, thereby allowing them to maneuver from operational and strategic distances to close with, destroy, and exploit the enemy in close and deep maneuver areas with sufficient combat power, tempo, and momentum. A-PNT addresses two critical capability gaps: Access and Integrity. Access is the ability to retrieve accurate PNT information in a contested Electronic Warfare/Cyber environment. Integrity is the ability to trust the PNT information. PNT is a critical enabler of many Army Maneuver, Fires, and Command and Control systems that are dependent on accurate Position and Timing, and a foundational Multi-Domain Battle capability to support: calibrated force posture (position and maneuver across strategic distances); multi-domain formations (operate in contested spaces against near-peer adversaries); convergence (continuous integration of capabilities in all domains). The current Global Positioning System (GPS) capability is a fixed frequency system susceptible to electronic warfare and field environments (e.g. urban, dense vegetation).

Joint Requirements Oversight Council Memo (JROCM) 049-10, dated 05 April 2010, approved the PNT Assurance Initial Capabilities Document and designated the Army as the Lead Component for Assured PNT. Army Futures Command approved the Mounted A-PNT System (MAPS) Directed Requirement (DR) on 13 January 2019. The Dismounted A-PNT System (DAPS) Directed Requirement was approved 05 April 2019. The Alternative Navigation (ALTNAV) Directed Requirement was approved in November 2019. MAPS transitions to a Capability Development Document (CDD) in June 2020 and DAPS transitions in FY 2021.

A-PNT consists of four Projects; (BV4) Area Protection and Alternative Navigation (Alt Nav) Technology Development, (ED5) Assured PNT, (EH8) Dismounted A-PNT System (DAPS), and (EJ2) Mounted A-PNT System (MAPS).

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604120A *I Assured Positioning, Navigation and Timing (PNT)*

Project Manager (PM) PNT manages these four Project areas (Area Protection and Alt Nav capabilities, Assured PNT, DAPS, and MAPS) constructed to investigate, prototype, experiment, model, assess, develop, modify, improve resiliency, test, equip, field, and sustain A-PNT solutions.

Assured Positioning, Navigation and Timing (A-PNT) consists of:

(BV4) - The Area Protection and Alt Nav Technology Development project supports the transition of technologies from industry, academia, and government Science & Technology organizations, and consequent development of alternative and complementary PNT technologies for integration into Mounted A-PNT System (MAPS) and Dismounted A-PNT System (DAPS). Area Protection & Alt Nav Technologies will be developed in order to demonstrate Alternative Navigation (ALTNAV), emerging complementary PNT, and net-enabled GPS solutions to provide Radio Frequency (RF) and non-RF threat mitigation.

(ED5) - The Assured PNT project funding line is for Resiliency and Software Assurance Measures (RSAM) software upgrades to legacy military GPS receivers. This line also supports the completion of network integration, installation and testing of ALTNAV signal enterprise build-out.

(EH8) - The Dismounted A-PNT System (DAPS) will provide the Soldiers equipped with Nett Warrior and other Soldier architecture compliant systems (e.g. Integrated Visual Augmentation System (IVAS)) conducting operations outside of vehicles, unhindered access the critical timing and position data to effectively engage targets, share data across the network and conduct mission command functions.

(EJ2) - The Mounted A-PNT System (MAPS) is a platform-mounted, ruggedized tactical PNT system which provides electronic protection capabilities that provide Army forces the ability to move, shoot, communicate, and provide situational awareness in Global Positioning System (GPS) challenged or denied environments. Included in the MAPS is the Anti-Jam Antenna System (AJAS) which provides GPS signal point protection and PNT Assurance in challenged environments through Anti-Jam, non-Radio Frequency, and alternate navigation technologies. AJAS enables tactical capabilities through assured signal acquisition in challenged environments. The AJAS will assist in delivering distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	128.125	-	128.125
Total Adjustments	0.000	0.000	128.125	-	128.125
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	128.125	-	128.125

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604120A *I Assured Positioning, Navigation and Timing (PNT)*

Change Summary Explanation

Program Element (PE) 0604120A restructured from PE1206120A in FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) BV4 / *Area Protection and Alt Nav Technology Development*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BV4: *Area Protection and Alt Nav Technology Development*	-	0.000	0.000	18.840	-	18.840	12.181	0.000	0.000	0.000	0.000	31.021
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Restructured from PE 1206120A Assured Positioning, Navigation and Timing / project FJ8, beginning in FY 2021.

A. Mission Description and Budget Item Justification

The primary focus of Area Protection and Alt Nav Technology Development project is to enable the effective transition of incremental and disruptive technologies to fieldable Positioning, Navigation and Timing (PNT) solutions to pace or overmatch current and evolving threats. Program activities including advanced component development, prototyping, and demonstration will bridge the gap between advanced technology development (S&T) and system development (products). It will demonstrate military utility to enable effective transitions and synergize development across products. It will also reduce or eliminate the transition of immature technologies to the product developer that potentially contribute to cost growth, schedule delays, and performance shortfalls.

Currently, military GPS is limited to two narrow frequency bands which could be defeated by our potential enemies. Additional Radio Frequency (RF) signals such as Global Navigation Satellite Systems (GNSS) and other satellite communications (SATCOM) sources integrated into PNT products and user equipment will provide alternatives against GPS jamming through frequency and source diversity. This line supports the Alternative Navigation (ALTNAV) capability and complementary PNT technologies (such as RF and non-RF technologies). ALTNAV provides frequency and source diversity to enable Army users with accurate and trusted position and time information in GPS degraded environments. ALTNAV is an instantiation of a complementary PNT technology and will include network integration, installation and testing of the infrastructure capability and user equipment. Other efforts include the continuation of situational awareness development, spectrum modification for PNT solutions, and modeling and simulation support.

To support effective transition to Mounted Assured PNT System (MAPS) and Dismounted Assured PNT System (DAPS), while minimizing integration cost and schedule, the project will develop and deliver government-owned Modular Open System Architecture (MOSA) compliant hardware & software frameworks. Evolving standards from the PNT Reference Architecture (Software and/or Hardware) will be utilized ensuring a path to plug and play solutions. Utilization of these standards will be verified in the Modular Integration Lab. Prior to transition, prototype compliance with a modular open suite of standards architecture will be demonstrated.

The development process will leverage commercial capabilities, existing contracts, industry, academia, DoD Science & Technology and critical Soldier touchpoints in an iterative process to transition solutions into future products, concepts of operation, architectures, and platforms to assure PNT.

FY 2021 Base funds in the amount of $18.840 million will continue prototyping and evaluation of the ALTNAV capability. Funds will additionally be used for risk reduction efforts for complementary PNT technologies, modeling & simulation, and technical & operational demonstrations.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** BV4 / *Area Protection and Alt Nav Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Area Protection & Alt Nav Technology Development	-	-	18.840	-	18.840
Description: The effort supports ALTNAV and complementary PNT capabilities. ***FY 2021 Base Plans:*** FY 2021 Base funds will continue prototyping and evaluation of the ALTNAV receiver integration and fusion capabilities. Funds will additionally be used for risk reduction efforts for complementary PNT technologies, modeling & simulation, experimentation, and used to conduct a technical demonstration. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Restructured from PE 1206120A Assured Positioning, Navigation and Timing / project FJ8, beginning in FY 2021.					
Accomplishments/Planned Programs Subtotals	-	-	18.840	-	18.840

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EH8: *DISMOUNTED*	-	-	13.337	-	13.337	12.446	-	-	-	0.000	25.783
• EJ2: *MOUNTED*	-	-	68.733	-	68.733	20.580	-	-	-	Continuing	Continuing
• AW5: *Modular GPS Independent Sensors Technology*	-	4.140	0.000	-	0.000	-	-	-	-	0.000	4.140
• AW6: *Modular GPS Independent Sensors Advanced Tech*	-	-	11.089	-	11.089	10.490	9.995	12.089	14.388	0.000	58.051
• AV8: *Navigation Warfare (NAVWAR) Advanced Technology*	-	5.118	2.535	-	2.535	2.044	1.998	5.968	5.968	0.000	23.631
• 779: *Command, Control And Platform Electronics Tech*	9.195	-	0.000	-	0.000	-	-	-	-	0.000	9.195
• 101: *Tactical Command and Control*	20.042	-	0.000	-	0.000	-	-	-	-	0.000	20.042

Remarks

The primary focus of Area Protection and Alt Nav Technology Development (BV4) project is to enable the effective transition of incremental and disruptive technologies from multiple sources (commercial capabilities, industry, academia, DoD Science & Technology) to fieldable PNT solutions to pace or overmatch current and evolving threats.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** BV4 / *Area Protection and Alt Nav Technology Development*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

The project includes prototyping or other demonstrations to prove out technology before it is integrated into a product. This is solidified by the following linkage:

- Modular GPS Independent Sensors (AW5 & AW6)
- Navigation Warfare (AV8)
- Command, Control & Platform Electronics tech (779)
- Tactical Command and Control (101)

Linked to:

Area Protection and Alt Nav technology development (BV4)

Linked to:

Dismounted Assured PNT Systems (EH8)
Mounted Assured PNT Systems (EJ2)

D. Acquisition Strategy

Area Protection & Alt Nav Technology Development program will utilize rapid prototyping and modeling & simulation to assess the military utility of the initial capabilities through critical Soldier touchpoints, laboratory, and field assessments to determine technology maturation for integration into Mounted Assured Positioning, Navigation, and Timing System (MAPS), Dismounted Assured Positioning, Navigation, and Timing System (DAPS), and other platforms. This will be implemented by utilizing a mix of competitive Other Transaction Authority (OTA)'s and Federal Acquisition Regulation contracts to obtain prototypes. This will inform the MAPS and DAPS CDD and other requirements documents for limited rate initial production, initial operational test & evaluation, and the full rate production decision.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) BV4 / *Area Protection and Alt Nav Technology Development*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	Various	Various : Various	-	-		-		0.932	Dec 2020	-		0.932	Continuing	Continuing	Continuing
		Subtotal	-	-		-		0.932		-		0.932	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALTNAV Receiver Development	Various	Various : Various	-	-		-		1.556	Dec 2020	-		1.556	Continuing	Continuing	Continuing
Complementary PNT Modeling & Simulation, and Experimentation	Various	Various : Various	-	-		-		5.813	Dec 2020	-		5.813	0.000	5.813	-
Modular Open System Architecture (pntOS & CMOSS)	Various	Various : Various	-	-		-		5.386	Dec 2020	-		5.386	Continuing	Continuing	Continuing
		Subtotal	-	-		-		12.755		-		12.755	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	Various	C5ISR : Various	-	-		-		1.450	Nov 2020	-		1.450	Continuing	Continuing	Continuing
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		-		1.958	Dec 2020	-		1.958	Continuing	Continuing	Continuing
		Subtotal	-	-		-		3.408		-		3.408	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) BV4 / *Area Protection and Alt Nav Technology Development*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Modular Integration Lab	MIPR	C5ISR : Various	-	-		-		1.745	Dec 2020	-		1.745	Continuing	Continuing	Continuing
		Subtotal	-	-		-		1.745		-		1.745	Continuing	Continuing	N/A

Remarks

The Technical demo includes a recurring series of data driven demonstrations and evaluations of high Technical Readiness Level (TRL) operationally effective PNT solutions that transition to production easily in order to pace/overmatch enemy PNT threat systems.

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		18.840		-		18.840	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** BV4 / *Area Protection and Alt Nav Technology Development*

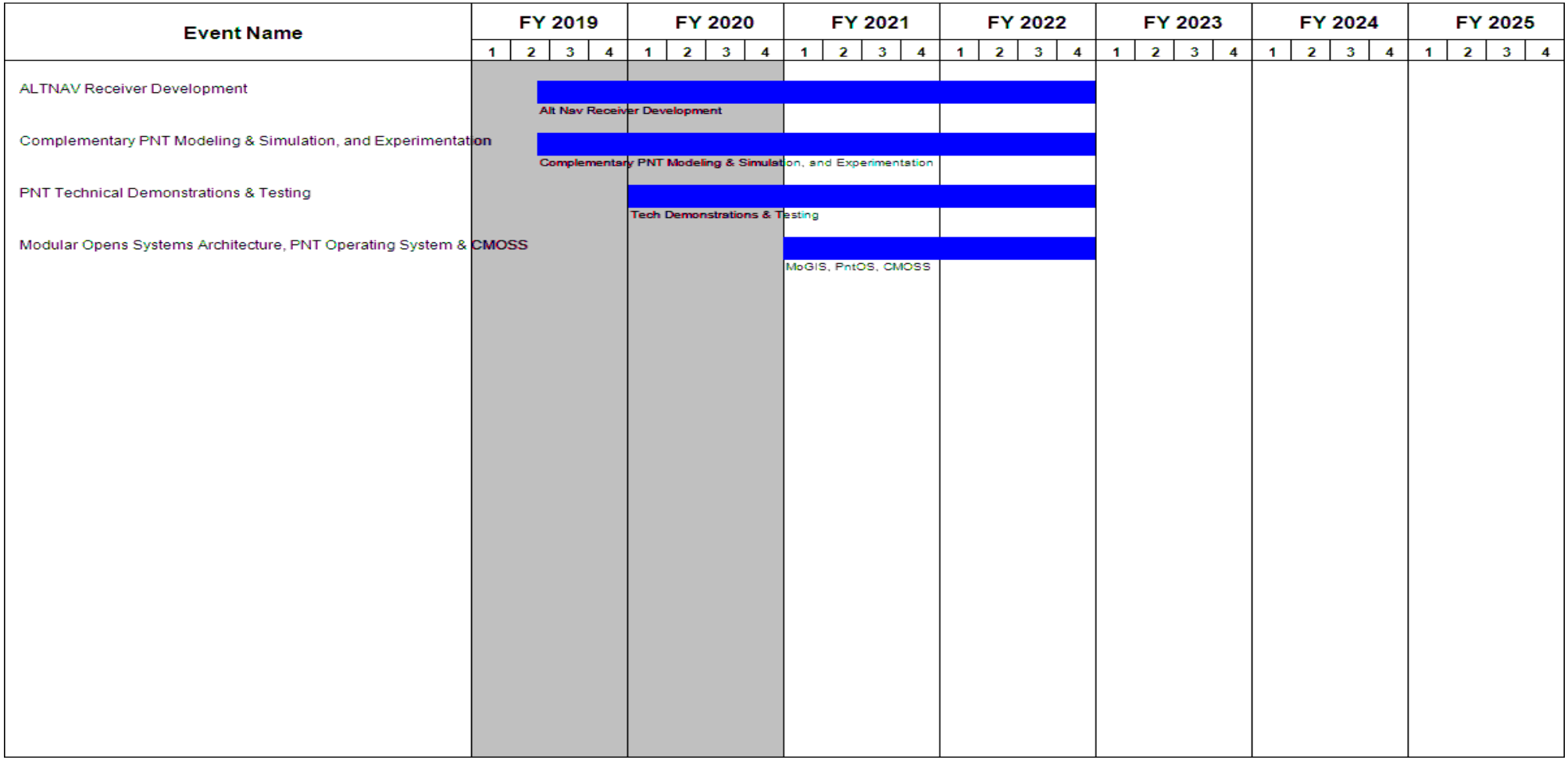

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** BV4 / *Area Protection and Alt Nav Technology Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
ALTNAV Receiver Development	2	2019	4	2022
Complementary PNT Modeling & Simulation, and Experimentation	2	2019	4	2022
PNT Technical Demonstrations & Testing	1	2020	4	2022
Modular Opens Systems Architecture, PNT Operating System & CMOSS	1	2021	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) ED5 / *Assured Positioning, Navigation and Timing (PNT)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
ED5: *Assured Positioning, Navigation and Timing (PNT)*	-	0.000	0.000	27.215	-	27.215	21.454	0.000	0.000	0.000	0.000	48.669
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is not a new start project. Program Element (PE) 0604120A project ED5 transitions from PE 1206120A project FJ8 Assured Positioning, Navigation and Timing beginning in FY 2021.

A. Mission Description and Budget Item Justification

The Assured Positioning, Navigation and Timing (PNT) project funds the Resiliency and Software Assurance Measures (RSAM) which provides increased capability and situational awareness for 500,000+ fielded legacy military Global Positioning System (GPS) receivers supporting systems and soldiers through at least 2035. Legacy GPS receivers targeted for RSAM enhancements, include but are not limited to, 226,000 Defense Advanced GPS Receiver (DAGR) and 200,000+ embedded Ground Based-GPS Receiver Applications Module (GB-GRAM). RSAM mitigates risks in a GPS-challenged operational environment until future Positioning, Navigation and Timing (PNT) solutions are fully deployed. Assured PNT enablers include prototype development and testing to demonstrate and prove emerging capabilities for legacy and future PNT resilient solutions. Assured PNT enablers also include the final phase of Alternative Navigation signal enterprise build-out, providing PNT data in a denied or degraded environment.

FY 2021 base funds in the amount of $27.215 million support PNT software enhancements to Army PNT receivers and capabilities. RSAM will support continued software development of RSAM Update 2 against emerging threats to legacy military GPS receivers, to include prototype testing and risk mitigation efforts. RSAM will coordinate integrated software testing with military system managers and the test community to validate software and synchronize RSAM deployment to the user. Assured PNT enablers include the final phase of network integration, installation and testing of Alternative Navigation signal enterprise build-out.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Resiliency and Software Assurance Measures (RSAM)	-	-	20.852	-	20.852
Description: Funding supports the following efforts:					
FY 2021 Base Plans: FY 2021 base funds in the amount of $20.852 million will support the release of RSAM GB-GRAM Update 1, support continued software development of RSAM DAGR Update 2 and RSAM GB-GRAM Update 2, to include prototype testing, formal qualification testing, and risk mitigation efforts. RSAM DAGR and GB-GRAM					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** ED5 / *Assured Positioning, Navigation and Timing (PNT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
receiver integration testing efforts for Update 2 will be performed in association with relevant military vehicles and systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Program Element (PE) 0604120A project ED5 transitions from PE 1206120A project FJ8 beginning in FY 2021. RDT&E funding decreased from $21.992 million in FY 2020 to $20.852 million in FY 2021.					
Title: Assured PNT Enablers ***Description:*** Funding supports the following efforts: ***FY 2021 Base Plans:*** FY 2021 base funds in the amount of $6.363 million will support the completion of network integration, installation and testing of Alternative Navigation signal enterprise build-out. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Program Element (PE) 0604120A project ED5 transitions from PE 1206120A project FJ8 beginning in FY 2021 to support the final phase of ALT NAV Enterprise Buildout. RDT&E funding decreased from $20.387 million in FY 2020 to $6.363 million in FY 2021.	-	-	6.363	-	6.363
Accomplishments/Planned Programs Subtotals	-	-	27.215	-	27.215

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49010: *Mounted/ Dismounted Receivers*	-	1.724	5.894	-	5.894	7.193	7.075	2.370	2.394	Continuing	Continuing

Remarks

K49010 / Mounted/Dismounted Receivers is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

Positioning, Navigation and Timing (PNT) Resiliency and Software Assurance Measures (RSAM) will provide software improvements to legacy military GPS receivers by awarding contracts to the original equipment manufacturers and industrial partners and leveraging the test community to develop and characterize prototypes and final software solutions. PNT Enablers will utilize a mix of competitive Other Transaction Authority (OTA)'s, Federal Acquisition Regulation contracts, and other contract vehicles to partner with industry to define, develop, procure and test prototypes to determine technologies for future PNT solutions.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) ED5 / *Assured Positioning, Navigation and Timing (PNT)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support	Various	Various : Various	2.693	-		-		1.475	Nov 2020	-		1.475	0.000	4.168	-
		Subtotal	2.693	-		-		1.475		-		1.475	0.000	4.168	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RSAM - DAGR Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	3.643	-		-		3.201	Nov 2020	-		3.201	0.000	6.844	-
RSAM - GB-GRAM Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	7.286	-		-		5.671	Nov 2020	-		5.671	0.000	12.957	-
Assured PNT Enablers	Various	Various : Various	0.476	-		-		6.363	Nov 2020	-		6.363	0.000	6.839	-
RSAM - MicroGRAM Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	-	-		-		3.427	Dec 2020	-		3.427	0.000	3.427	-
		Subtotal	11.405	-		-		18.662		-		18.662	0.000	30.067	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Contracting Services	C/FFP	DCS Corp : APG, MD	9.445	-		-		2.502	Jan 2021	-		2.502	0.000	11.947	-
Engineering and Technical Government Services	MIPR	Various : Various	2.057	-		-		0.358	Dec 2020	-		0.358	0.000	2.415	-
		Subtotal	11.502	-		-		2.860		-		2.860	0.000	14.362	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) ED5 / *Assured Positioning, Navigation and Timing (PNT)*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RSAM - Government Engineering Support	MIPR	Various : Various	2.827	-		-		0.676	Mar 2021	-		0.676	0.000	3.503	-
RSAM - Contractor Engineering Support	Various	DCS Corp : APG, MD	1.278	-		-		0.648	Mar 2021	-		0.648	0.000	1.926	-
Platform Integration Testing	Various	Various : Various	3.675	-		-		2.574	Mar 2021	-		2.574	0.000	6.249	-
RSAM Test Equipment	Various	Various : Various	0.250	-		-		0.320	Mar 2021	-		0.320	0.000	0.570	-
		Subtotal	8.030	-		-		4.218		-		4.218	0.000	12.248	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	33.630	-		0.000		27.215		-		27.215	0.000	60.845	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** ED5 / *Assured Positioning, Navigation and Timing (PNT)*

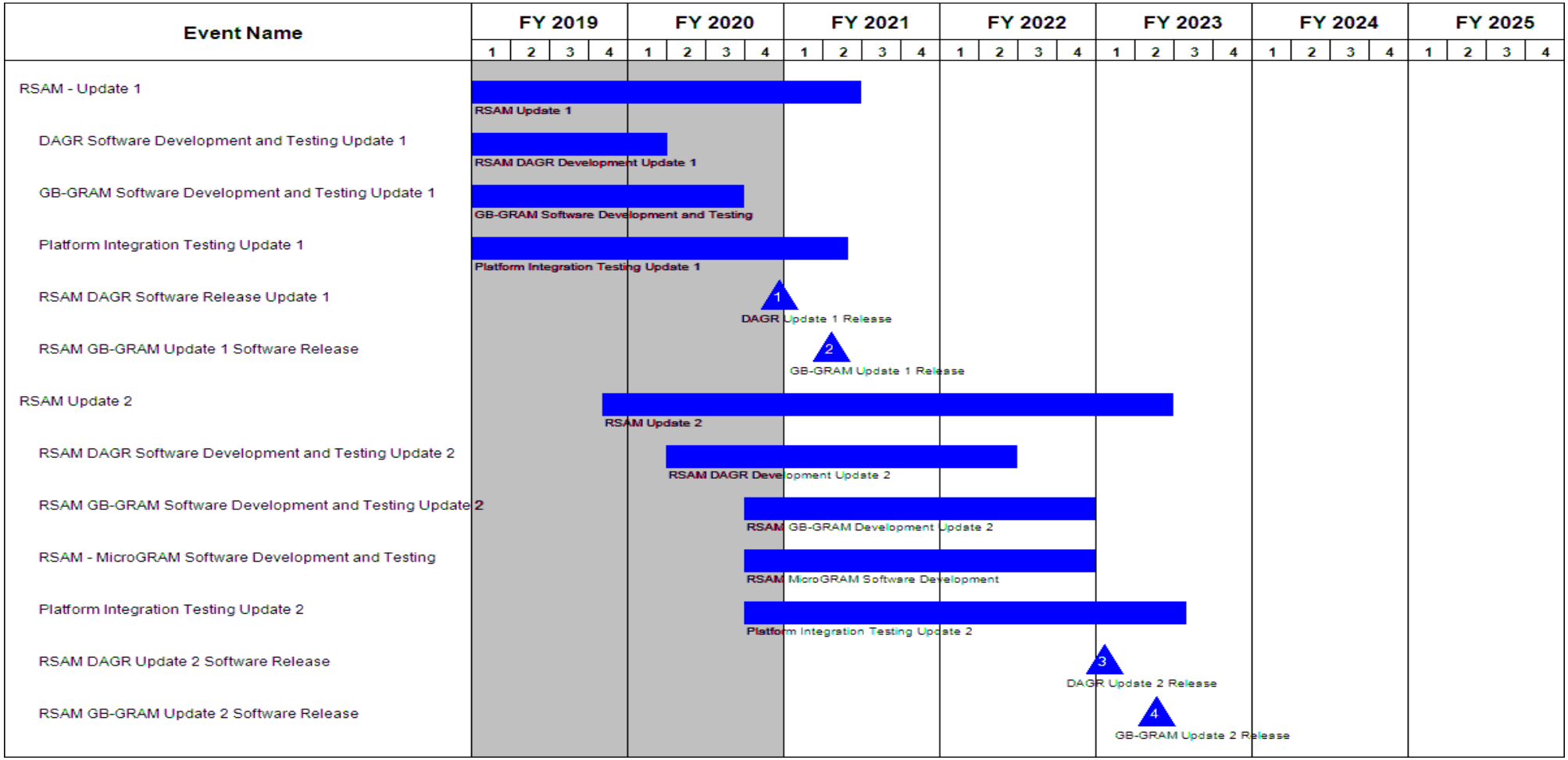

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** ED5 / *Assured Positioning, Navigation and Timing (PNT)*

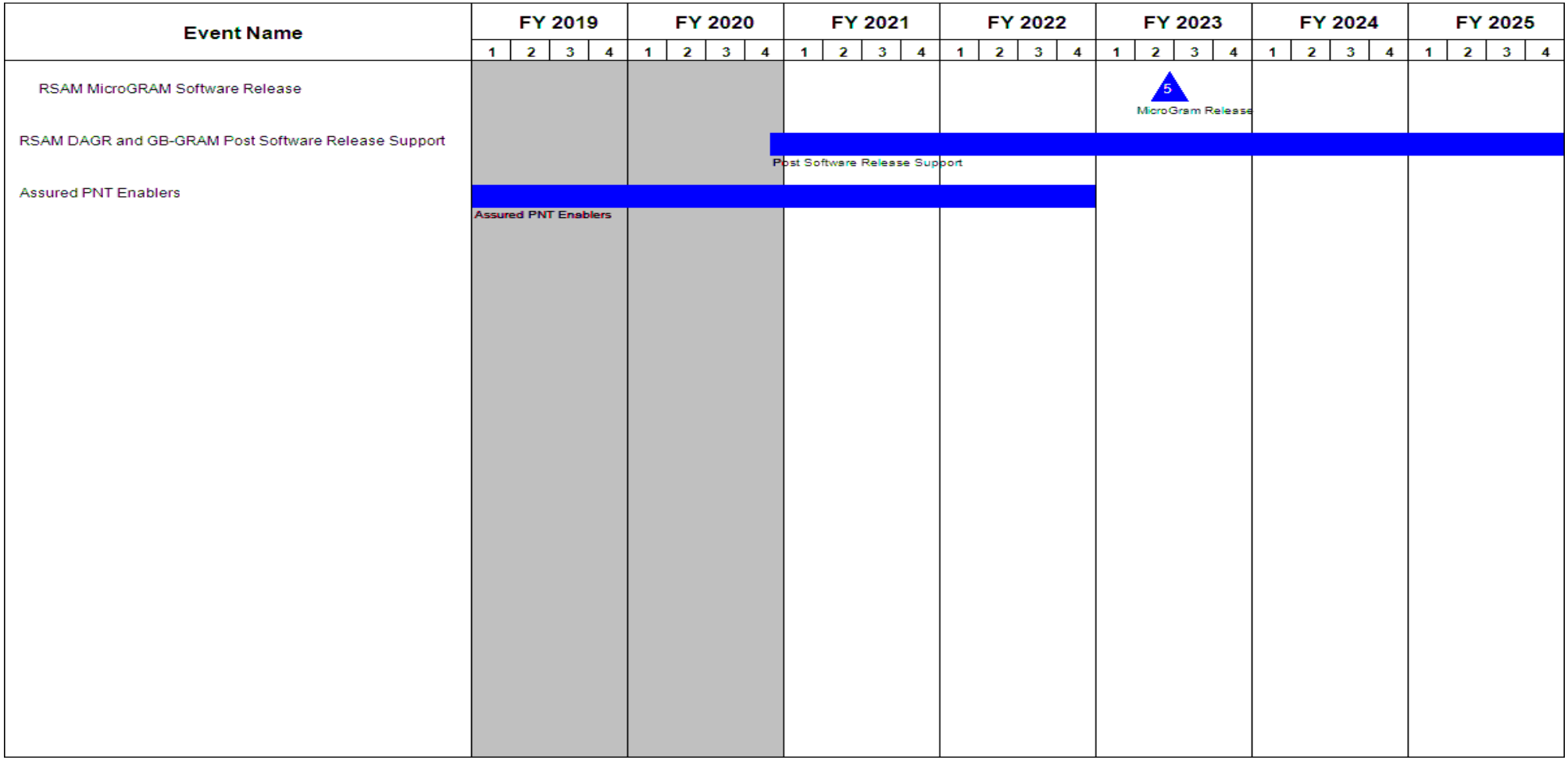

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** ED5 / *Assured Positioning, Navigation and Timing (PNT)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
RSAM - Update 1	1	2019	2	2021
DAGR Software Development and Testing Update 1	1	2018	1	2020
GB-GRAM Software Development and Testing Update 1	1	2019	3	2020
Platform Integration Testing Update 1	1	2019	2	2021
RSAM DAGR Software Release Update 1	4	2020	4	2020
RSAM GB-GRAM Update 1 Software Release	2	2021	2	2021
RSAM Update 2	4	2019	2	2023
RSAM DAGR Software Development and Testing Update 2	2	2020	2	2022
RSAM GB-GRAM Software Development and Testing Update 2	4	2020	4	2022
RSAM - MicroGRAM Software Development and Testing	4	2020	4	2022
Platform Integration Testing Update 2	4	2020	3	2023
RSAM DAGR Update 2 Software Release	1	2023	1	2023
RSAM GB-GRAM Update 2 Software Release	2	2023	2	2023
RSAM MicroGRAM Software Release	2	2023	2	2023
RSAM DAGR and GB-GRAM Post Software Release Support	4	2020	4	2025
Assured PNT Enablers	1	2019	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EH8 / *DISMOUNTED*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EH8: *DISMOUNTED*	-	0.000	0.000	13.337	-	13.337	12.446	0.000	0.000	0.000	0.000	25.783
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is not a new start project. Program Element (PE) 0604120A project EH8 transitions from PE1206120A project FJ9 beginning in FY 2021.

A. Mission Description and Budget Item Justification

Dismounted Assured PNT (A-PNT) System (DAPS) implements congressional and OSD guidance to develop and field Military Code (M-Code) Ground User Equipment (MGUE) receivers and provides the Soldiers equipped with Nett Warrior (NW) and other Soldier architecture compliant systems (e.g. Integrated Visual Augmentation System (IVAS)) the critical timing and position data to effectively engage targets, share data across the network, and conduct mission command functions. DAPS is planned to be a size, weight and power (SWaP) optimized form-factor that paces the threats and includes development and integration of Global Positioning System (GPS) and non-GPS sensors. DAPS integrates with the NW system and other Soldier architecture compliant systems, and distributes PNT information to the End-User Device (EUD). DAPS includes receiver software capable of fusing sensors and Global Navigation Satellite Systems (GNSS) signals resulting in additional integrity for military GPS in denied environments and includes a M-Code receiver solution, or a Selective Availability Anti-Spoofing Module (SAASM) system with growth path to M-Code.

Through an iterative approach, DAPS will continue to fuse M-Code, GNSS, and non-GPS sensors, as well as fuse Alternate Navigation (ALTNAV) and other complementary PNT sources in a SWaP constrained system in order to pace/overmatch the threat and continue to deliver critical timing and position data to effectively engage targets, share data across the network, and conduct mission command functions.

FY 2021 Base funds in the amount of $13.337 Million will continue current DAPS prototype variants, followed by final acceptance testing and certification. Funds will converge ALTNAV and complementary PNT hardware and software for planned and emerging DAPS improvements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Dismounted A-PNT System (DAPS)	-	-	13.337	-	13.337
Description: This effort supports the development and delivery of DAPS prototypes for integration, assessment and performance testing.					
FY 2021 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EH8 / *DISMOUNTED*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2021 Base funds in the amount of $13.337 Million will continue current DAPS prototype variants, followed by final acceptance testing and certification. Funds will converge ALTNAV and complementary PNT hardware and software for planned and emerging DAPS improvements. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Program Element (PE) 0604120A project EH8 transitions from PE1206120A project FJ9 beginning in FY 2021. Funding decreased from PE1206120A project FJ9 from $32.360 Million in FY 2020 to $13.337 Million in FY 2021 on Program Element (PE) 0604120A project EH8. This reduction is based upon transitioning from development into production.					
Accomplishments/Planned Programs Subtotals	-	-	13.337	-	13.337

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49020: *Dismounted Hub*	-	-	48.449	-	48.449	49.570	26.458	6.063	3.960	Continuing	Continuing
• BV4: *Area Protection and Alt Nav Technology Development*	-	-	18.840	-	18.840	12.181	-	-	-	0.000	31.021

Remarks

K49020 / Dismounted Hub is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

Risk reduction prototyping efforts from 0604120A BV4 Area Protection and Alt Nav Technology Development will transition PNT Modernization/complementary PNT capabilities to the Dismounted A-PNT System (DAPS).

D. Acquisition Strategy

The DAPS strategy consists of the continuous refinement of the current DAPS material solution through an operational approach that incorporates congressionally and OSD mandated transition to M-Code and includes minimizing risk to the operational force by delivering the best available technology to fulfill critical capability gaps that outpace emerging threat environments. DAPS will provide the Soldier conducting operations outside of vehicles the means to maintain accurate position, velocity,and time information in a Global Positioning System (GPS) challenged or degraded/denied environments where space based PNT may be limited or denied. DAPS will provide improved performance over the currently fielded Defense Advanced GPS Receiver (DAGR).

DAPS will use an iterative acquisition approach and is structured to incrementally develop, deliver and field DAPS capabilities through continued development of emerging technologies. Follow-on capabilities will build on the previous technology and incorporate complementary PNT technologies as they mature. This "buildingblock" approach will continue until DAPS capabilities fully meet the requirements.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EH8 / *DISMOUNTED*

The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing Other Transaction Authority (OTA) agreements and/or other FAR based mechanisms to competitively obtain prototypes. The Government will conduct laboratory, performance and field testing. The findings from these efforts will provide technology viability and allow for the transition to limited production. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EH8 / *DISMOUNTED*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	Various	Various : Various	-	-		-		0.618	Dec 2020	-		0.618	Continuing	Continuing	-
		Subtotal	-	-		-		0.618		-		0.618	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DAPS Prototyping	MIPR	Various : Various	-	-		-		9.373	Dec 2020	-		9.373	Continuing	Continuing	-
Engineering and Technical Product Development	MIPR	C5ISR : APG, MD	-	-		-		1.850	Dec 2020	-		1.850	0.000	1.850	-
		Subtotal	-	-		-		11.223		-		11.223	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	Various	C5ISR : Various	-	-		-		0.353	Nov 2020	-		0.353	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		-		0.381	Dec 2020	-		0.381	Continuing	Continuing	-
		Subtotal	-	-		-		0.734		-		0.734	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Evaluations	MIPR	Various : Various	-	-		-		0.762	Dec 2020	-		0.762	0.000	0.762	-
		Subtotal	-	-		-		0.762		-		0.762	0.000	0.762	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EH8 / *DISMOUNTED*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		13.337		-		13.337	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EH8 / *DISMOUNTED*

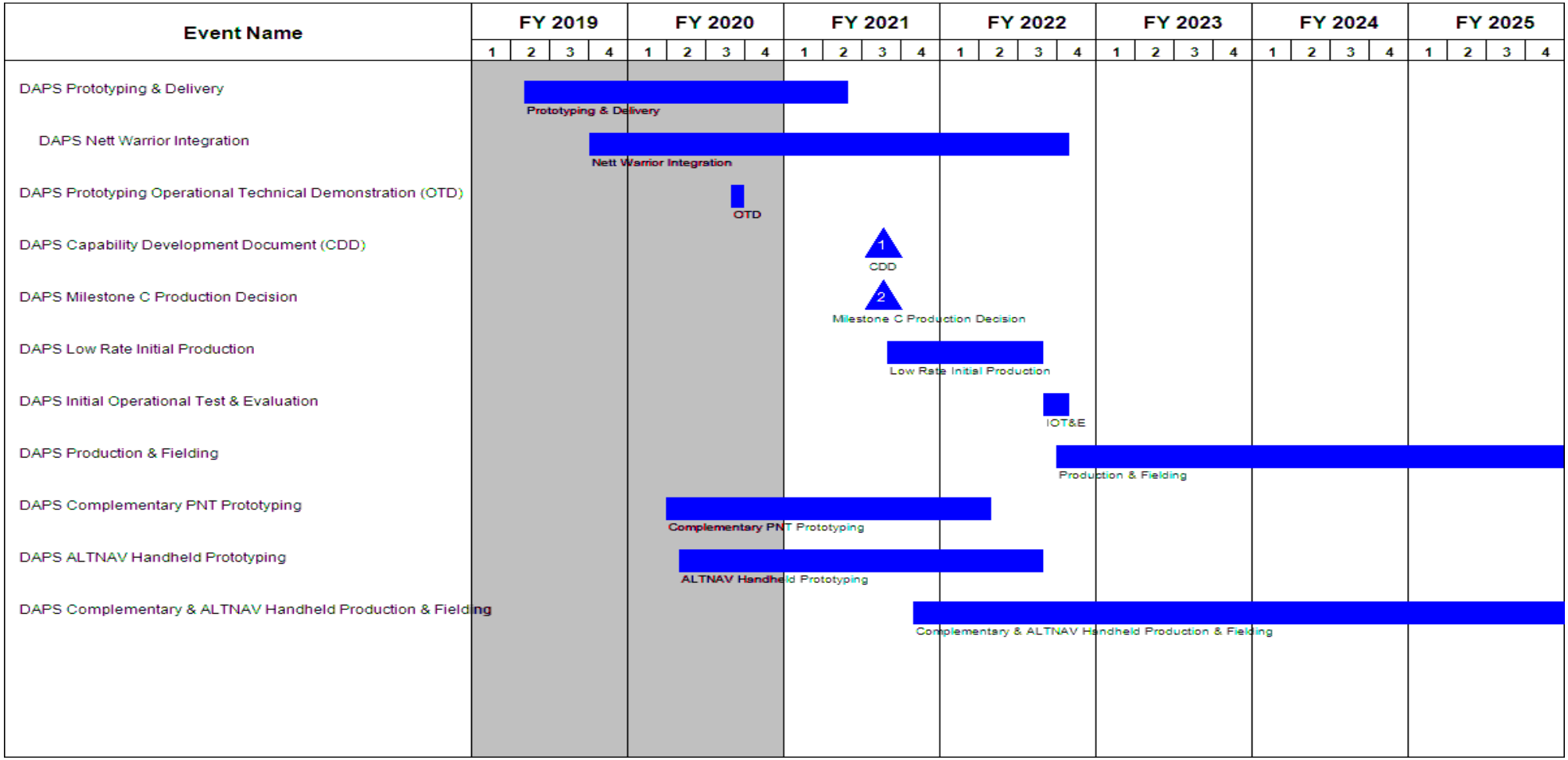

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EH8 / *DISMOUNTED*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
DAPS Prototyping & Delivery	2	2019	2	2021
DAPS Nett Warrior Integration	4	2019	4	2022
DAPS Prototyping Operational Technical Demonstration (OTD)	3	2020	3	2020
DAPS Capability Development Document (CDD)	3	2021	3	2021
DAPS Milestone C Production Decision	3	2021	3	2021
DAPS Low Rate Initial Production	3	2021	3	2022
DAPS Initial Operational Test & Evaluation	3	2022	4	2022
DAPS Production & Fielding	4	2022	4	2025
DAPS Complementary PNT Prototyping	2	2020	2	2022
DAPS ALTNAV Handheld Prototyping	2	2020	3	2022
DAPS Complementary & ALTNAV Handheld Production & Fielding	4	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EJ2 / *MOUNTED*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EJ2: *MOUNTED*	-	0.000	0.000	68.733	-	68.733	20.580	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is not a new start project. Program Element (PE) 0604120A Project EJ2 transitions from PE1206120A, combining Project FK2 Mounted and Project FK3 Anti-Jam Antenna for the MAPS systems in FY 2021.

A. Mission Description and Budget Item Justification

Mounted Assured Positioning, Navigation and Timing System (MAPS) implements congressional and OSD guidance to develop and field M-code Ground User Equipment (MGUE) receivers and provides the Army's ground maneuver forces access to assured PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied. A-PNT products are ruggedized tactical systems which provides electronic protection capabilities that enable Army forces the ability to move, shoot, communicate, and provide situational awareness in Global Positioning System (GPS) challenged or denied environments. MAPS addresses two critical capability gaps: Access and Integrity. Access is the ability to retrieve PNT information in a contested Electronic Warfare/Cyber environment. Integrity is the ability to trust the PNT information. PNT is a critical enabler of many Army Maneuver, Fire and Command and Control systems that are dependent on accurate Position and Timing. Included in the MAPS is the Anti-Jam Antenna System (AJAS) which provides GPS signal point protection. The AJAS will assist in delivering distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization.

FY 2021 Base dollars in the amount of $68.733 million support system engineering and management support, integration, testing and training of the MAPS capability for client platforms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Mounted A-PNT System (MAPS)	-	-	68.733	-	68.733
Description: This effort supports development of and documentation for client platform integration, technical data packages for Mounted Assured Positioning, Navigation, and Timing (PNT) System (MAPS) in preparation for Initial Operational Test and Evaluation. Early integration will accelerate Full Rate Production fielding.					
FY 2021 Base Plans: FY 2021 Base dollars in the amount of $68.733 million support system engineering and management support, integration, testing and training of the MAPS capability for client platforms.					
FY 2020 to FY 2021 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EJ2 / *MOUNTED*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Program Element (PE) 0604120A project EJ2 transitions from PE1206120A project FK2 beginning in FY 2021. Funding increased from PE1206120A project FK2 from $66.471 Million in FY 2020 to $68.733 Million in FY 2021. The increase is due to Program Element (PE) 0604120A Project EJ2 transition from PE 1206120A, combining Projects FK2 Mounted and FK3 Anti-Jam Antenna.					
Accomplishments/Planned Programs Subtotals	-	-	68.733	-	68.733

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49030: *Mounted Hub A-PNT*	-	41.728	80.585	12.566	93.151	81.623	153.841	94.775	97.866	Continuing	Continuing
• BV4: *Area Protection and Alt Nav Technology Development*	-	-	18.840	-	18.840	12.181	-	-	-	0.000	31.021

Remarks

K49030 / Mounted Hub A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

Risk reduction prototyping efforts from 0604120A BV4 Area Protection and Alt Nav Technology Development will transition PNT Modernization/complementary PNT capabilities to the Mounted A-PNT System (MAPS).

D. Acquisition Strategy

The MAPS acquisition strategy consists of the continuous refinement of the current MAPS material solution through an operational approach that incorporates congressionally and OSD mandated transition to M-code and includes minimizing risk to the operational force by delivering the best available technology to fulfill critical capability gaps that outpace emerging threat environments. The MAPS program will utilize the iterative approach by continuous frontloading of operational assessments, Soldier touchpoints, and evaluations to finalize decisions for the MAPS material solution to one vendor design. MAPS is leveraging competitive Other Transaction Authority (OTA) agreements to prototype and assess industry capabilities. MAPS will conduct Electromagnetic Interference and Environmental Testing, as well as performance testing in the System Integration Lab (SIL), anechoic chamber testing and an Operational Technical Demonstration in the most affordable manner that allows for future modernization. Both the Capability Development Document and the Basis of Issue Plan will be approved in FY2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EJ2 / *MOUNTED*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		-		2.574	Jan 2021	-		2.574	0.000	2.574	Continuing
		Subtotal	-	-		-		2.574		-		2.574	0.000	2.574	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mounted PNT Integration - Combat Platforms	C/CPFF	Various : Various	-	-		-		7.927	Dec 2020	-		7.927	0.000	7.927	Continuing
Mounted PNT Integration - Combat Support Platforms	C/CPFF	Various : Various	-	-		-		27.510	Mar 2021	-		27.510	0.000	27.510	Continuing
Mounted PNT Integration - Combat Systems Platforms	C/CPFF	Various : Various	-	-		-		11.190	Apr 2021	-		11.190	0.000	11.190	Continuing
Production Maturation	TBD	TBD : TBD	-	-		-		8.099	May 2021	-		8.099	0.000	8.099	Continuing
Client Software Development (JBCP)	TBD	TBD : TBD	-	-		-		1.295	Feb 2021	-		1.295	0.000	1.295	Continuing
Technical Manuals and Support Equipment	TBD	TBD : TBD	-	-		-		0.406	Dec 2020	-		0.406	0.000	0.406	Continuing
		Subtotal	-	-		-		56.427		-		56.427	0.000	56.427	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	Various	C5ISR : Various	-	-		-		1.038	Nov 2020	-		1.038	0.000	1.038	Continuing
Engineering and Technical Services - Contractor	C/CPFF	Various : Various	-	-		-		2.513	Jan 2021	-		2.513	0.000	2.513	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) EJ2 / *MOUNTED*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
New Equipment Training (NET)	TBD	TBD : TBD	-	-		-		0.667	Apr 2021	-		0.667	0.000	0.667	Continuing
		Subtotal	-	-		-		4.218		-		4.218	0.000	4.218	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Field Testing / Development Test	TBD	Various : TBD	-	-		-		5.514	Dec 2020	-		5.514	0.000	5.514	Continuing
		Subtotal	-	-		-		5.514		-		5.514	0.000	5.514	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		68.733		-		68.733	0.000	68.733	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EJ2 / *MOUNTED*

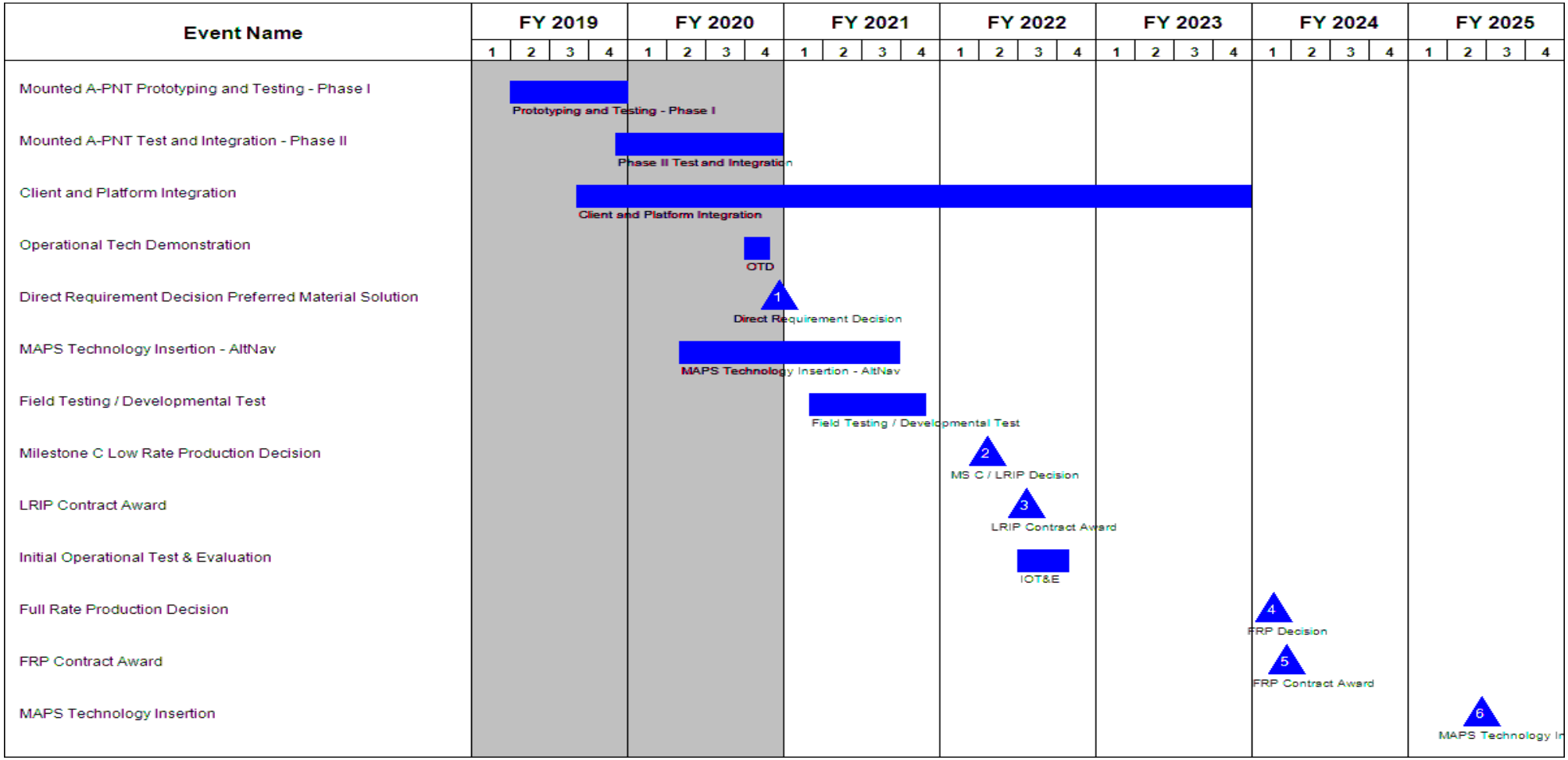

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** EJ2 / *MOUNTED*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Mounted A-PNT Prototyping and Testing - Phase I	1	2019	4	2019
Mounted A-PNT Test and Integration - Phase II	4	2019	4	2020
Client and Platform Integration	3	2019	4	2023
Operational Tech Demonstration	4	2020	4	2020
Direct Requirement Decision Preferred Material Solution	4	2020	4	2020
MAPS Technology Insertion - AltNav	2	2020	3	2021
Field Testing / Developmental Test	1	2021	4	2021
Milestone C Low Rate Production Decision	2	2022	2	2022
LRIP Contract Award	3	2022	3	2022
Initial Operational Test & Evaluation	3	2022	4	2022
Full Rate Production Decision	1	2024	1	2024
FRP Contract Award	1	2024	1	2024
MAPS Technology Insertion	2	2025	2	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604121A *I Synthetic Training Environment Refinement & Prototyping*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	39.890	103.621	129.547	-	129.547	10.658	7.728	7.889	7.890	0.000	307.223
FD6: *Synthetic Training Environment Refine & Prototype*	-	39.890	29.176	122.553	-	122.553	10.658	7.728	7.889	7.890	0.000	225.784
SV1: *Soldier/Squad Virtual Trainer*	-	0.000	74.445	6.994	-	6.994	0.000	0.000	0.000	0.000	0.000	81.439

A. Mission Description and Budget Item Justification

The Synthetic Training Environment (STE) is the next generation holistic collective training capability that will enable leaders, Soldiers, and units to train where they will fight, along with their partners with whom they will fight, in complex operational environments to include dense urban, woodland, jungle, dessert, and sub-terrain, before they get there. The STE will operate within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. STE is currently a pre-acquisition effort leveraging Other Transactional Agreements (OTAs) on the path to Initial Operating Capability (IOC) in FY 2021. This collective training capability will revolutionize Army training by providing the repetitions and sets necessary to achieve improved proficiency prior to live training and combat; thereby improving Soldier lethality and survivability. The STE will be available where training occurs (home station, combat training centers, armories, institutions, ship-board, deployed).

STE is comprised of three main Lines of Effort: 1) STE-Information System; 2) Reconfigurable Virtual Collective Trainers (RVCT), both air and ground; and 3) Soldier / Squad Virtual Trainer (SSVT). STE-IS (delivers the Common Synthetic Environment, like an operating system), consisting of Global Terrain/One World Terrain (OWT), Training Simulation Software (TSS), and Training Management Tools (TMT). The RVCT Air and Ground (RVCT A/G) will collectively train units, using proponent developed Combined Arms Training Strategies (CATS), on a simulated, fully interactive, real-time battlefield. S/SVT is broken into Squad Immersive Virtual Trainer (SiVT) and Soldier Virtual Trainer (SVT). SiVT, which is the immersive training capability delivered as part of the Integrated Visual Augmentation System (IVAS) provides initial squad training capability for S/SVT in Increment 1. SVT will support Army wide formations such as artillery, Military Police, and units for Weapons Skills Development, Joint Fires Training and Use of Force. Future lines of effort under market research include the integration of Live training and Next Generation Constructive. The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, and will include the future Live and Constructive capabilities. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle; a Secretary of Defense priority.

FY 2021 base funding of $129.547 million will finalize the technical development and demonstration of prototype designs to deliver IOC at 5 installations (Ft. Hood, JBLM, Ft. Leonard wood, Ft. Benning, and Ft. Drum) for STE-IS, RVCT, and SiVT (IVAS). Funds will also support conducting a Limited User Test (LUT) to verify and validate the capabilities of TSS, TMT, OWT and RVCT as an integrated prototype solution in the CSE. This effort will reduce technical risk, validate design, validate cost estimates and refine requirements for future STE, S/SVT and Live capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0604121A *I Synthetic Training Environment Refinement & Prototyping*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	39.890	136.761	22.672	-	22.672
Current President's Budget	39.890	103.621	129.547	-	129.547
Total Adjustments	0.000	-33.140	106.875	-	106.875
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-33.140			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	106.875	-	106.875

Change Summary Explanation

FY 2020 decrease of $33.140 million was due to congressional directed reductions for projects FD6 ($12.500 million) and SV1 ($20.640 million).
FY2021 - $58.000 million was realigned from STE Procurement funding (NA2020), and an additional $49.000 million was added to better align with planned Other Transactional Authority (OTA) awarded in summer of FY 2019 (STE-IS and RVCT). This funding drives the development momentum leading up to the Limited User Test and IOC for STE in FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	Project (Number/Name) FD6 / *Synthetic Training Environment Refine & Prototype*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FD6: *Synthetic Training Environment Refine & Prototype*	-	39.890	29.176	122.553	-	122.553	10.658	7.728	7.889	7.890	0.000	225.784
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The STE will be a single, yet comprehensive interconnected training system that provides a Common Synthetic Environment (CSE), in which air and ground units from crew/section through Army Service Component Command (ASCC) conduct realistic multi-echelon / multi-domain combined arms maneuver, air ground integration, and mission command training. All of these components are interconnected and based off of a standard, modular and open system architecture model. The focus of the FD6 project is on the STE-IS and RVCT components of the holistic training strategy. The STE-IS provides a common software environment consisting of the Training Management Tool (TMT), Training Simulation Software (TSS), and One World Terrain (OWT) solution. The Training Management Tool (TMT) is the capability that enables units to quickly plan collective training events, prepare training events; execute and monitor events, and assess event results and readiness.

The Training Simulation Software (TSS), the core STE simulation engine, provides a realistic STE-IS that enables collective training from Soldier/Squad through ASCC. The STE-IS is a dynamic, digital representation of the Operational Environment (OE) and the military capabilities in the scenario. The TSS provides entity, aggregate, and common services, as well as adjudicates STE-IS interactions at the entity level (e.g., Computer-Generated Forces (CGF), and synthetic equipment).

The One World Terrain (OWT) is a 3-Dimensional global terrain capability and associated information services that supports the virtual replication of the physical Earth and complexities of the Operational Environment in support of training in the STE. The STE and RVCT requirements, which are codified in abbreviated Capabilities Development Documents (CDD-A) with full versions currently in staffing, directly support the Army Collective Training Environment - Initial Capabilities Document (ACTE-ICD) as the Army's cornerstone for replicating the Operational Environment (OE) during training events enabling the Army to train as it fights. Separate, but interoperable, RVCT systems are required for both air and ground collective training. The Air RVCT will represent the U.S. Army, Army National Guard, and Army Reserves fleet of rotary wing aircraft, and specified U.S. Marine Corps (USMC) aircraft. The Ground RVCT will represent ground/amphibious track and wheeled vehicles from the U.S. Army, Army National Guard, Special Operations Units and the USMC.

FY 2020 Update: STE User Assessment conducted in Apr-May 2019 further refined the requirement and demonstrated that the technology was quickly maturing and provided better costing data for STE. In June 2019, the contracting command awarded five subsequent STE OTAs for the STE-IS, RVCT, and S/SVT (Weapons Optimization) to seven vendors allowing better refinement of the technical requirements needed to achieve IOC in 4Q 2021. The focus of FY 2020 is on development and technical user assessments leading to a successful Limited User Test and Initial Operating Capability for the STE-IS and RVCT components in FY 2021.

FY 2021 base funding of $122.553 million will finalize the technical development and demonstration of prototype designs to deliver IOC at 5 installations (Ft. Hood, Joint Base Lewis McCord, Ft. Leonard Wood, Ft. Benning, and Ft. Drum) for STE-IS and RVCT. In addition, funds support conducting a Limited User Test (LUT) to verify and validate the capabilities of STE-IS and RVCT as an integrated prototype solution with military utility. This effort will reduce technical risk, validate design, validate cost estimates and refine requirements for future STE, S/SVT and Live capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** FD6 / *Synthetic Training Environment Refine & Prototype*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Program Management ***Description:*** Program management, engineering and technical oversight, contract support, and travel for the development of the program. ***FY 2020 Plans:*** Funds support the program management activities through the OTA agreements in support of STE-IS and RVCT capability. Management support includes requirements decomposition, technical assessments, user integration assessment and test planning. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Phased support activities initiate transition into procurement for fielding events and O&M for civilian management support.	6.811	0.200	-
Title: Engineering, Support, Test & Evaluation ***Description:*** Direct engineering development, support and test of the STE-IS and RVCT through awarded OTA vehicles. ***FY 2020 Plans:*** FY 2020 funding is critical to maintain technical advancements in the STE-IS and RVCT components in driving to a successful LUT and IOC in FY 2021. Funds support prototype development to for iterative Design Reviews of the SW baseline and Air/Ground components of RVCT, Interim Contractor Support (ICS) support through development, Cloud Services for network capability, and the development and attribution of 3 dimensional (3D) one world terrain. ***FY 2021 Plans:*** FY 2021 base funding of $122.553 million heavily focuses on finalizing the development and prototype solutions of the STE-IS and RVCT components reaching LUT and IOC in FY 2021. Funds support the continued development and assessment of technical capabilities through technical assessments and user assessments, and test planning events. FY 2021 will finish out the development prototype activities on the training software baseline and reconfigurable units (Air and Ground) as well as 3D terrain data for the 5 IOC locations in 4Q 2021. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funds ramp up the technical and user assessments as well as 3D terrain needed for IOC events in 4Q 2021. Funds support negotiated contract phasing of prototype, cloud, and terrain services required for proving out the initial capabilities at 5 sites. FY 2021 also accounts for the integration of S&T technical refinements into the SW baseline in support of the STE-IS and RVCT capabilities prior to fielding IOC.	33.079	27.651	122.553
Title: FY 2020 SBIR/STTR Transfer	-	1.325	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** FD6 / *Synthetic Training Environment Refine & Prototype*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	39.890	29.176	122.553

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• NA2000: *Synthetic Training Environment (STE)*	-	14.449	13.063	-	13.063	74.077	73.024	66.750	67.590	Continuing	Continuing

Remarks

D. Acquisition Strategy

STE will be developed and acquired as an incrementally deployed software intensive program leveraging accelerated acquisition authorities when appropriate. To ensure speed and agility to deliver and modernize STE, a modular open systems architecture (MOSA) will be developed enabling the Army to exploit rapid advancements in cutting-edge commercial visualization and immersion technologies. STE will employ an IT Box requirements model to enable agile development of the STE-IS with parallel incremental development of the RVCT A/G and S/SVT. This model facilitates leveraging commercial and Government technology development that are necessary for future Live and Constructive centered increments. Other acquisition elements such as testing, contracting, and technology transition will consider any and all means available to innovate and incorporate complementary support to add momentum in this approach.

STE Increment 1 IOC is programmed for 4Q 2021. IOC is defined as the first fielding and acceptance of the STE-IS capability at installations identified IAW the Basis of Issue Plan (BOIP). IOC fielded STE systems will include the following attributes: verification, validation and accreditation process complete; STE-IS capabilities in support of RVCT A/G and Squad Immersive Virtual Trainer (SiVT) IOC in FY 2021 and ultimately the Soldier Virtual Trainer (SVT) IOC in FY 2023; meeting Information Assurance and Risk Management Framework requirements. New Equipment Training (NET) will include the capability to support the RVCT, and the ability to provide initial sustainment via interim contractor support (ICS). Soldiers will interface with the STE-IS through the Reconfigurable Virtual Collective Trainer (RVCT) and SiVT via the Integrated Visual Augmentation System (IVAS).

Future phases currently under market research will provide Soldier/Squad Virtual Trainer (S/SVT) capabilities and integrate Live training components as well as Next Generation Constructive (NGC).

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** FD6 / *Synthetic Training Environment Refine & Prototype*

Five (5) OTAs were awarded in FY 2019 in support of STE prototype initiatives: STE-IS (TSS/TMT, OWT), RVCT, Live (market research only), and SVT Weapons Optimization (market research only). Confidence events and evaluations were built into the OTAs to determine the readiness and availability of technology in support of 4Q 2021 IOC. Prime(s) and Sub-vendors will execute the STE agreement(s) through an Agile development process with established success criteria and their DevOps processes. Vendors will continually include the Government and all stakeholders (Internal and external) in the Agile development process. This process will ensure all parties have transparency and early input into the modular design effort in order to support success of the product(s) being developed for the STE.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	Project (Number/Name) FD6 / *Synthetic Training Environment Refine & Prototype*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	Various	Various : Orlando, FL	5.577	6.811		0.200		-		-		-	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.325		-		-		-	0.000	1.325	-
		Subtotal	5.577	6.811		1.525		-		-		-	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development STE-IS/Common Synthetic Environment	C/FP	VT Mak : Cambridge, MA	23.432	11.496	Jun 2019	-		26.822	Dec 2020	-		26.822	Continuing	Continuing	Continuing
Product Development STE-IS/One World Terrain	C/FP	Vricon : Mclean, VA	23.238	2.310	Jun 2019	3.390	Dec 2019	55.295	Dec 2020	-		55.295	Continuing	Continuing	Continuing
Product Development Reconfigurable Virtual Collective Trainers	C/FP	Cole Engineering Services Inc : Orlando, FL	9.626	16.003	Jun 2019	24.261	Dec 2019	24.810	Dec 2020	-		24.810	Continuing	Continuing	Continuing
Product Development Soldier/Squad Virtual Trainer (IVAS)	C/FP	Microsoft : Redmond, WA	34.792	-		-		13.626	Dec 2020	-		13.626	Continuing	Continuing	Continuing
Small Business Innovation/ Tech Insertion	Various	Various : Orlando, FL	-	3.270		-		2.000	Dec 2020	-		2.000	Continuing	Continuing	Continuing
		Subtotal	91.088	33.079		27.651		122.553		-		122.553	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	96.665	39.890		29.176		122.553		-		122.553	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** FD6 / *Synthetic Training Environment Refine & Prototype*

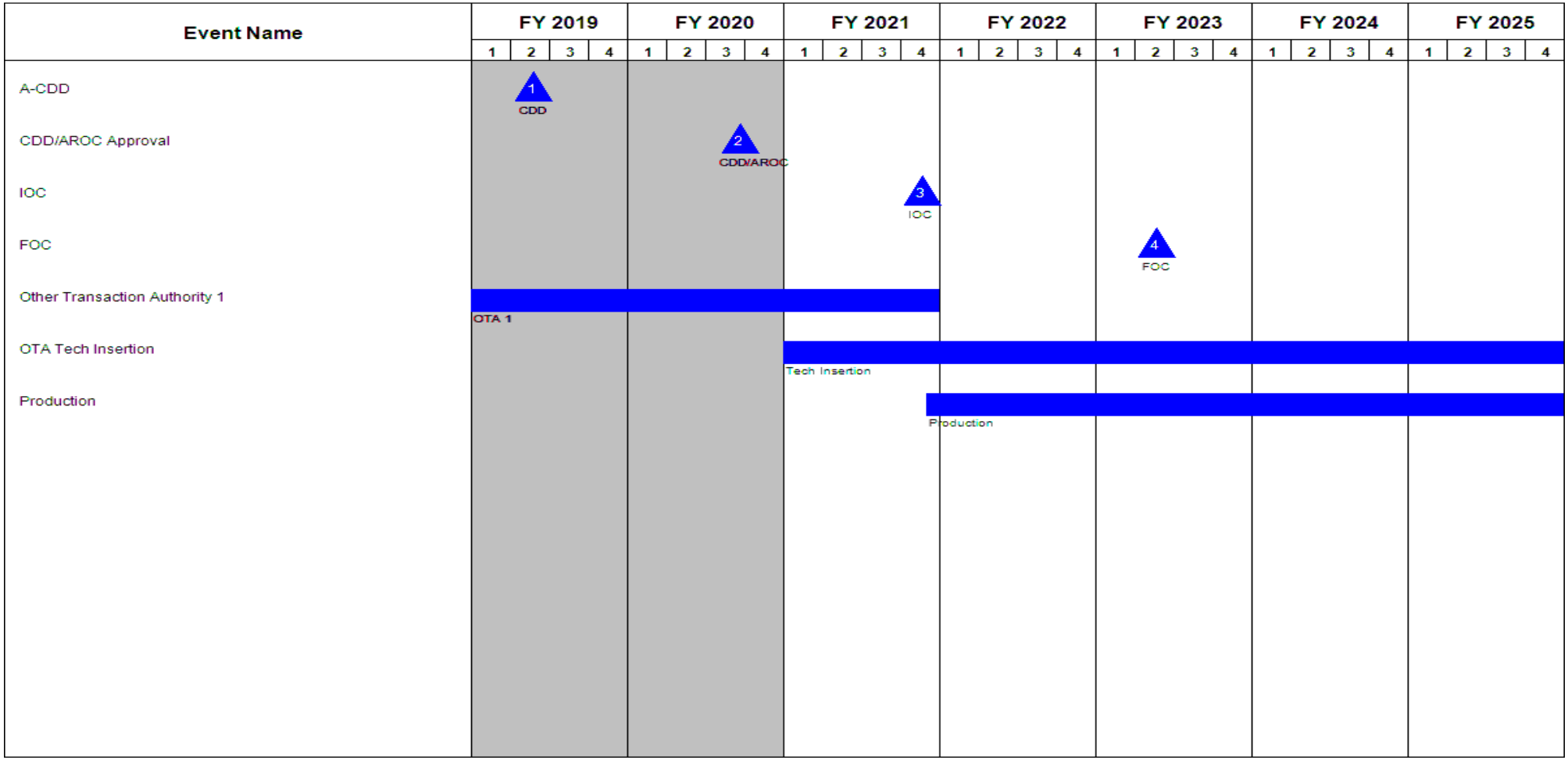

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** FD6 / *Synthetic Training Environment Refine & Prototype*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
A-CDD	2	2019	2	2019
CDD/AROC Approval	3	2020	3	2020
IOC	4	2021	4	2021
FOC	2	2023	2	2023
Other Transaction Authority 1	2	2018	4	2021
OTA Tech Insertion	1	2021	4	2025
Production	4	2021	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	Project (Number/Name) SV1 / *Soldier/Squad Virtual Trainer*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
SV1: *Soldier/Squad Virtual Trainer*	-	0.000	74.445	6.994	-	6.994	0.000	0.000	0.000	0.000	0.000	81.439
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The United States Army identified a near term requirement for a Soldier and Squad Virtual Trainer (S/SVT) to address the small unit collective training gaps, and to merge the Engagement Skills Trainer (EST) II, Call for Fire Trainer (CFFT) III, and the current non program of record Use-of-Force trainer into a single program starting in FY 2021. The S/SVT is the next generation trainer that enables Soldiers/Marines to conduct squad, weapons, and joint fires training, as well as rehearse lethal and non-lethal use-of-force interactions prior to live events to measure the unit's Mission Essential Task List proficiency, which then provide a unit's Objective 'T' readiness.

S/SVT is comprised of Squad Immersive Trainer (SiVT); also commonly referred to as both the IVAS and the Soldier Virtual Trainer (SVT) capabilities. The first increment of the SSVT, which is the Squad immersive Virtual Trainer (SiVT) capability, integrates into the Heads Up Display (HUD) 3.0 as part of the Integrated Visual Augmentation System (IVAS). Increments 2 and 3 of S/SVT combines individual Soldier and squad training into a single capability and includes STE Squad Capability (SSC), Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF), which integrate the NEXTGEN Marksmanship and the NEXTGEN Call For Fire Artillery Virtual Training capability into the STE baseline.
The second phase; the SVT system design combines and integrates several individual Soldier and squad training capabilities, Weapon Skills Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF).

S/SVT is dependent and interconnected through the STE-IS software baseline. The STE-IS core cross-cutting capabilities deliver software, application(s) and services that optimize cloud-enabled capability simulation processing to Reconfigurable Virtual Collective Trainer (RVCT), Soldier Squad Virtual Trainer (S/SVT), and the future Next Generation Constructive (NGC) capability to include Force-on-Force (FoF) and Force-on-Target (FoT) Live training instrumentation.

FY 2021 funding of $6.994 million reinitiates the market research and prototype solutions for the SVT solution assessing industry and academia's technical readiness and availability around Weapons Skills Development, Joint Fires and Use of Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Engineering, Support, Test & Evaluation	-	71.064	6.994
Description: Market Research and Prototype Assessment of Soldier Virtual Trainer capabilities.			
FY 2020 Plans: FY 2020 continues the prototype and development of the SiVT (IVAS) training components of the Soldier Lethality Heads Up Display (HUD) goggle and 3D immersive terrain as well the key integration of the holistic SW baseline enabling the overarching			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** SV1 / *Soldier/Squad Virtual Trainer*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Soldier Virtual Trainer. Prototypes support the engineering and development of Capability sets 3 and 4, technical and user assessments, and test planning for the LUE test event and IOC in 4Q 2021. ***FY 2021 Plans:*** FY 2021 funding of $6.994 million reinitiates the market research and prototype solutions for the SVT solution assessing industry and academia?s technical readiness and availability around Weapons Sill Development, Joint Fires and Use of Force. Resources will support a new OTA prototype award to include technical assessments and soldier user assessments of technical availability within industry helping to refine the overarching requirement for the SVT solution. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Decrease in funding due to completion of the initial SiVT (IVAS) prototype capability and reengagement of the further SVT solutions with industry.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	3.381	-
Accomplishments/Planned Programs Subtotals	-	74.445	6.994

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• NA2000: *Synthetic Training Environment (STE)*	-	14.449	13.063	-	13.063	74.077	73.024	66.750	67.590	Continuing	Continuing

Remarks

D. Acquisition Strategy

The S/SVT uses the Synthetic Training Environment (STE) modular open systems architecture via virtual interface and hardware standards. S/SVT optimizes training delivery through the employment of a combination of Operational Environment (OE) mixed reality visualization and Natural User Interface (NUI) technologies to maximize efficiencies for the integration of system capabilities. The S/SVT system design combines and integrates several individual Soldier and squad training capabilities, Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF), into a single capability that can be conducted simultaneously or

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** SV1 / *Soldier/Squad Virtual Trainer*

individually and enable physical movement/exertion related to the execution of Soldier/Marine individual and squad collective training tasks. The system is required to be man transportable and deployable worldwide. It delivers training at the Point of Need (PoN) supporting Army-wide formations such as artillery, Military Police, and units for weapons skills development.

Two (2) OTAs awarded in FY 2019 in support of S/SVT prototype initiatives: SiVT (IVAS) Holistic Joint with Soldier Lethality, and SVT Weapons Optimization (market research only). Confidence events and evaluation criteria were built into the OTAs to determine technical availability and readiness in support of 4Q 2021 IOC. Prime(s) and Sub-vendors will execute the agreement(s) through an Agile development process with established success criteria and their DevOps processes. Vendors will continually include the Government and all stakeholders (Internal and external) in the Agile development process. This process will ensure all parties have transparency and early input into the design effort and success of the product(s) being developed for the STE.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	Project (Number/Name) SV1 / *Soldier/Squad Virtual Trainer*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		3.381		-		-		-	0.000	3.381	-
		Subtotal	-	-		3.381		-		-		-	0.000	3.381	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	Aberdeen Proving Grounds : MD	-	-		71.064		6.994	May 2021	-		6.994	0.000	78.058	-
		Subtotal	-	-		71.064		6.994		-		6.994	0.000	78.058	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		74.445		6.994		-		6.994	0.000	81.439	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** SV1 / *Soldier/Squad Virtual Trainer*

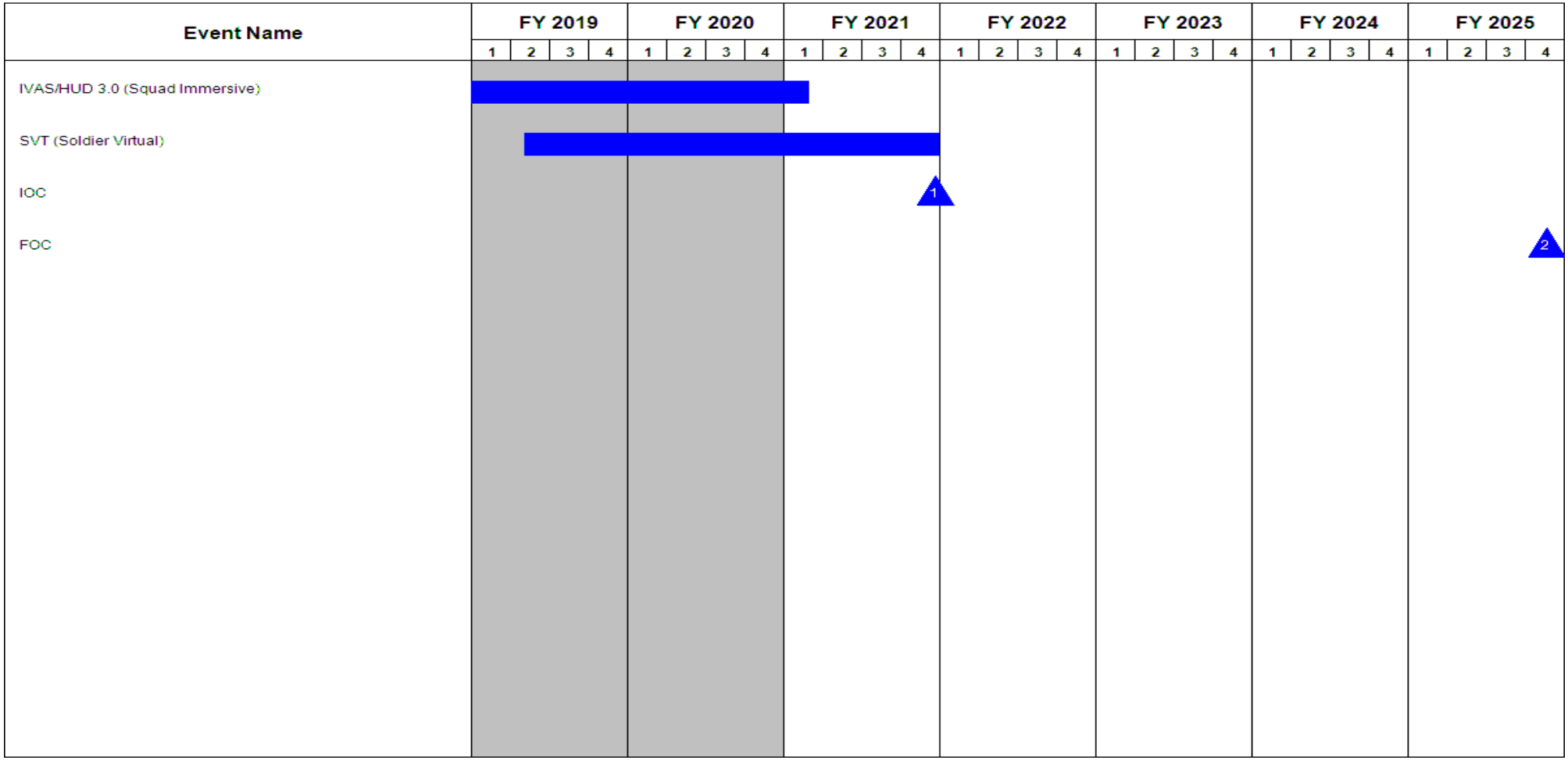

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604121A / *Synthetic Training Environment Refinement & Prototyping*	**Project (Number/Name)** SV1 / *Soldier/Squad Virtual Trainer*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
IVAS/HUD 3.0 (Squad Immersive)	2	2018	1	2021
SVT (Soldier Virtual)	2	2019	4	2021
IOC	4	2021	4	2021
FOC	4	2025	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	13.831	-	13.831	14.650	15.480	16.330	17.200	0.000	77.491
CD4: *Counter Improvised-Threat Demonstration*	-	0.000	0.000	13.831	-	13.831	14.650	15.480	16.330	17.200	0.000	77.491

Note

This is a new start in FY2021.

This Program Element is a New Start for Fiscal Year 2021 (FY21).

A. Mission Description and Budget Item Justification

This Program Element (PE) develops prototypes and demonstrates technology for detecting and defeating Improvised Explosive Devices (IED). The goal of this Project is to mature technology to increase the ability of deployed forces to positively identify IEDs with minimal false alarms and increase the rate of advance of route clearance missions. Additionally the objective is to positively neutralize or mitigate the effects of IEDs with minimal collateral damage. Driven by the current threat facing deployed U.S. forces, this PE enables rapid development and delivery of capabilities that enable the detection, neutralization, and risk mitigation of IEDs and their effects. These technologies are intended to be matured and demonstrated for integration onto existing Department of Defense weapon systems.

This PE is coordinated with the Under Secretary of Defense for Research and Engineering (USD/R&E) including the Defense Threat Reduction Agency (DTRA).

Work in this PE was previously conducted under PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	13.831	-	13.831
Total Adjustments	0.000	0.000	13.831	-	13.831
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	13.831	-	13.831

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604134A *I Counter Improvised-Threat Demonstration, Prototype Development, and Testing*

Change Summary Explanation

This PE is realigned in FY21 from PE 0604134BR Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing as a result of the transfer of Counter-IED (C-IED) Research, Development, Test, and Evaluation (RDTE) activities to the Army and is fully coordinated with the Under Secretary of Defense for Research and Engineering (USD/R&E) and Defense Threat Reduction Agency (DTRA).

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	Project (Number/Name) CD4 / *Counter Improvised-Threat Demonstration*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
CD4: *Counter Improvised-Threat Demonstration*	-	0.000	0.000	13.831	-	13.831	14.650	15.480	16.330	17.200	0.000	77.491
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY2021.

This Program Element is a New Start for Fiscal Year 2021 (FY21).

A. Mission Description and Budget Item Justification

This Project develops prototypes and demonstrates technology for detecting and defeating Improvised Explosive Devices (IED). The goal of this Project is to mature technology to increase the ability of deployed forces to positively identify IEDs with minimal false alarms and increase the rate of advance of maneuver forces. Additionally the objective is to positively neutralize IEDs with minimal collateral damage. Driven by the current threat facing deployed U.S. forces, this PE enables rapid development and delivery of capabilities that enable the detection, neutralization, and mitigation of IEDs and their effects.

This Project is coordinated with the Under Secretary of Defense for Research and Engineering (USD/R&E) including the Defense Threat Reduction Agency (DTRA).

Work in this Project was previously conducted under PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Vehicle Borne IED Detection Technology Demonstration	-	-	1.975
Description: This effort conducts technology demonstration of sensing technologies to detect IEDs at entry control points for fixed bases. This effort uses nuclear quadropole resonance detection sensors matured in FY 2020 by the Defense Threat Reduction Agency to detect Vehicle Borne IEDs at vehicle check point with minimal false alarms.			
FY 2021 Plans: Will integrate nuclear quadropole resonance detection sensor into a vehicle check point. Will demonstrate the ability of the sensor to detect IEDs concealed in a vehicle.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.			
Title: Vehicle Borne IED Warnings and Indicators Technology Demonstration ***Description:*** This effort demonstrates fusion of existing sensing technologies to provide warnings and indicators for the presence of Vehicle Borne IEDs in areas surrounding fixed sites. This effort uses detection techniques matured in FY 2020 by the Defense Threat Reduction Agency to predict the presence of Vehicle Borne IEDs using information collected by sensor systems located in the vicinity of fixed sites. ***FY 2021 Plans:*** Will conduct a demonstration of detection techniques applied to data collected by local sensor systems to identify indicators of Vehicle Borne IEDs. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.	-	-	1.341
Title: Radio Controlled IED Detection Technology Demonstration ***Description:*** This effort demonstrates Radio Controlled IED detection exploiting advanced network techniques. This effort demonstrates the ability to detect Radio Controlled IEDs with minimal false alarms. ***FY 2021 Plans:*** Will apply advanced network techniques to identify Radio Controlled IEDs at standoff distances. Will perform test and evaluation of the detection techniques and document for urgent materiel release purposes. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.	-	-	2.595
Title: Anti-Armor IED Detection Technology Demonstration ***Description:*** This effort demonstrates anti-armor IED detection using technologies to include high resolution electro-optical / infrared sensors to detect component characteristics to identify the location of IEDs prior to detonation. ***FY 2021 Plans:***	-	-	2.583

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will conduct a demonstration of the use of advanced electro-optical / infrared sensor processing techniques to detect component characteristics to identify the location potential IEDs. Will demonstrate the ability of these sensors to detect anti-armor IEDs at a standoff distance and quantify false alarm rates using a cluttered demonstration area. Will perform test and evaluation of the sensor technology and document for urgent material release purposes. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.			
Title: Mitigation of Anti-Armor IED Technology Demonstration ***Description:*** This effort demonstrates mitigation of Anti-Armor IED effects using technologies developed by the Defense Threat Reduction Agency in FY 2020. This effort will demonstrate the use of physical countermeasure technology to mitigate the effects of explosively formed penetrators and other explosively driven IED threats. ***FY 2021 Plans:*** Will demonstrate the Anti-Armor IED mitigation technology using surrogate threat IEDs to evaluate the residual effects of the IED on a surrogate armor plate. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.	-	-	0.550
Title: Booby Trap Structure IEDs Detection Technology Demonstration ***Description:*** This effort demonstrates detection techniques developed by the Defense Threat Reduction Agency (DTRA) in FY 2020 using small unmanned aerial systems (UAS) with compact sensor technologies including light detection and ranging (LIDAR) to develop high resolution imagery of structures with the ability to inspect multi-level structures for the presence of IEDs. This effort demonstrates the ability to develop high fidelity mapping of multi-level structures to identify potential locations of IEDs. ***FY 2021 Plans:*** Will continue development of compact LIDAR sensor technologies for use on small platforms. Will demonstrate the ability of to detect concealed IEDs in an multi-level urban structure using a micro UAS. ***FY 2020 to FY 2021 Increase/Decrease Statement:***	-	-	2.537

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.			
Title: Personnel Borne IED Detection Technology Demonstration ***Description:*** This effort demonstrates Personnel Borne IED (PBIED) detection aggregating information from a network of small, inexpensive sensor technologies including electro-optical and millimeter wave radar subgarment imagers to sense the presence of PBIEDs attached to personnel through thin walls. This effort demonstrates the ability to aggregate sensor data to identify PBIEDs with minimal false alarms. ***FY 2021 Plans:*** Will mature sensor fusion technologies to identify concealed PBIEDs in various environments. Will perform test and evaluation of the sensor technology and document for urgent material release purposes. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is a realignment from PE 0604134BR, Counter Improvised-Threat Technology Demonstration, Prototype Development, and Testing, as a result of the transfer of C-IED RDT&E activities to the Army.	-	-	2.250
Accomplishments/Planned Programs Subtotals	-	-	13.831

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Army will coordinate plans with the Under Secretary of Defense for Research and Engineering (USD (R&E)), Defense Threat Reduction Agency (DTRA) and other Services to prototype and demonstrate CIED technologies, with Army and Service Laboratories and/or industry performing the demonstration activities. The Army will use existing and new contracts to perform these efforts with selected industry partners based on solicitations issued. The Army will continue promising technology demonstrations started in FY20 by DTRA based on review with DTRA, USD (R&E) and other Services.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Vehicle Borne IED Detection Technology Demonstration	C/TBD	To Be Determined : To Be Determined	-	-		-		1.975	Dec 2020	-		1.975	0.000	1.975	-
Vehicle Borne IED Warnings and Indicators Technology Demonstration	C/TBD	TBD : TBD	-	-		-		1.341		-		1.341	0.000	1.341	-
Remote Controlled IED Detection Technology Demonstration	C/TBD	TBD : TBD	-	-		-		2.595	Dec 2020	-		2.595	0.000	2.595	-
Anti-Armor IED Detection Technology Demonstration	C/TBD	TBD : TBD	-	-		-		2.583	Dec 2020	-		2.583	0.000	2.583	-
Mitigation of Anti-Armor IED Technology Demonstration	C/TBD	TBD : TBD	-	-		-		0.550		-		0.550	0.000	0.550	-
Booby Trap Structure IEDs Detection Technology Demonstration	Various	TBD : TBD	-	-		-		2.537		-		2.537	0.000	2.537	-
Personnel Borne IED Detection Technology Demonstration	C/TBD	TBD : TBD	-	-		-		2.250		-		2.250	0.000	2.250	-
		Subtotal	-	-		-		13.831		-		13.831	0.000	13.831	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		13.831		-		13.831	0.000	13.831	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*

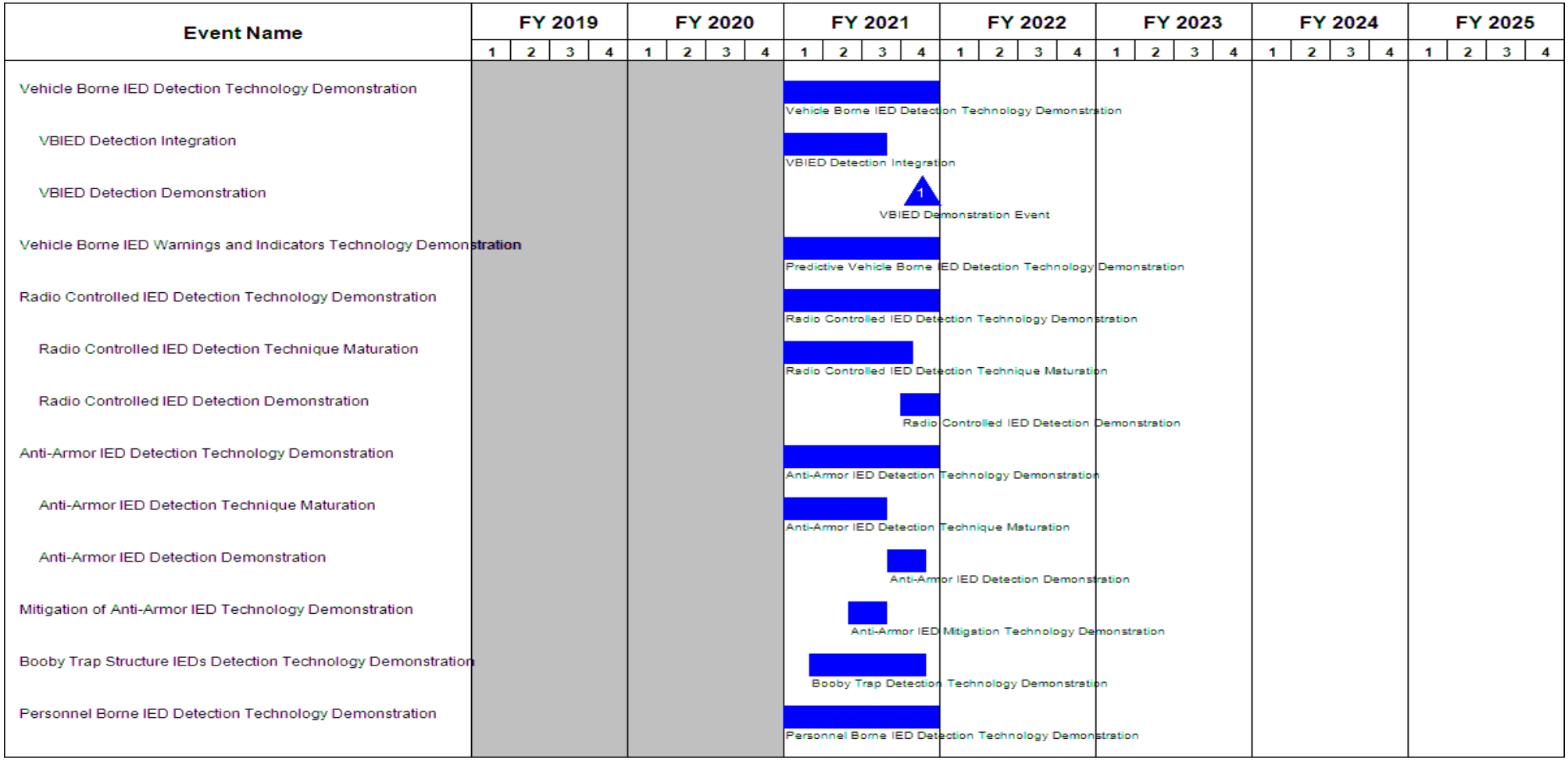

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604134A / *Counter Improvised-Threat Demonstration, Prototype Development, and Testing*	**Project (Number/Name)** CD4 / *Counter Improvised-Threat Demonstration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Vehicle Borne IED Detection Technology Demonstration	1	2021	4	2021
VBIED Detection Integration	1	2021	3	2021
VBIED Detection Demonstration	4	2021	4	2021
Vehicle Borne IED Warnings and Indicators Technology Demonstration	1	2021	4	2021
Radio Controlled IED Detection Technology Demonstration	1	2021	4	2021
Radio Controlled IED Detection Technique Maturation	1	2021	4	2021
Radio Controlled IED Detection Demonstration	4	2021	4	2021
Anti-Armor IED Detection Technology Demonstration	1	2021	4	2021
Anti-Armor IED Detection Technique Maturation	1	2021	3	2021
Anti-Armor IED Detection Demonstration	3	2021	4	2021
Mitigation of Anti-Armor IED Technology Demonstration	2	2021	3	2021
Booby Trap Structure IEDs Detection Technology Demonstration	1	2021	4	2021
Personnel Borne IED Detection Technology Demonstration	1	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604182A / *Hypersonics*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	404.000	801.417	-	801.417	526.501	755.294	592.452	576.243	0.000	3,655.907
HX1: *Long-Range Hypersonic Weapon*	-	0.000	404.000	801.417	-	801.417	526.501	755.294	592.452	576.243	0.000	3,655.907

A. Mission Description and Budget Item Justification

The Program Element (PE) 0604182A Hypersonics funds the Rapid Capabilities and Critical Technologies Office (RCCTO) hypersonic effort.

Project HX1 Long-Range Hypersonic Weapon funds the RCCTO to field an experimental/prototype Hypersonic Weapon System with residual combat capability at the Battery Level as part of the Strategic Fires Battalion in support of Multi-domain Operations. The Long Range Hypersonic Weapon (LRHW) system will provide the Army a prototype strategic attack weapon system to defeat Anti Access/Area Denial (A2/AD) capabilities, suppress adversary Long Range Fires, and engage other high payoff/time critical targets. LRHW is common with other Department of Defense (DoD) hypersonic programs using the Common Hypersonic Glide Body, and the Navy 34.5 inch booster. Additionally the LRHW will include an existing Army Battle Fire Control system.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	228.000	181.000	-	181.000
Current President's Budget	0.000	404.000	801.417	-	801.417
Total Adjustments	0.000	176.000	620.417	-	620.417
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	176.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	620.417	-	620.417

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: HX1: *Long-Range Hypersonic Weapon*		
Congressional Add: *Transfer from RDTE, DW line 124*	-	31.000
Congressional Add: *Program increase*	-	130.000
Congressional Add: *Program increase - hypersonic and strategic materials and structures center of excellence*	-	15.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604182A / *Hypersonics*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Congressional Add Subtotals for Project: HX1	-	176.000
Congressional Add Totals for all Projects	-	176.000

Change Summary Explanation

The $620.417 million increase is driven in support of the fielding of an experimental prototype with residual combat capability . The program plans on executing and accelerating the building and delivery of Long Range Hypersonic Weapon, Common Hypersonic Glide Body (CHGB) prototypes, and 34.5 inch Missile Body booster prototypes. Additionally, prototyping of Thermal Protection System (TPS) for the glide bodies will be stood up to expand the industrial base of TPS suppliers.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / *Hypersonics*	Project (Number/Name) HX1 / *Long-Range Hypersonic Weapon*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
HX1: *Long-Range Hypersonic Weapon*	-	0.000	404.000	801.417	-	801.417	526.501	755.294	592.452	576.243	0.000	3,655.907
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Program Element (PE) 0604182A Hypersonics funds the Rapid Capabilities and Critical Technologies Office (RCCTO) hypersonic effort.

Project HX1 Long-Range Hypersonic Weapon funds the RCCTO to field an experimental/prototype Hypersonic Weapon System with residual combat capability at the Battery Level as part of the Strategic Fires Battalion in support of Multi-domain Operations. The Long Range Hypersonic Weapon (LRHW) system will provide the Army a prototype strategic attack weapon system to defeat Anti Access/Area Denial (A2/AD) capabilities, suppress adversary Long Range Fires, and engage other high payoff/time critical targets. LRHW is common with other Department of Defense (DoD) hypersonic programs using the Common Hypersonic Glide Body, and the Navy 34.5 inch booster. Additionally the LRHW will include an existing Army Battle Fire Control system.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Long Range Hypersonic Weapon	-	217.646	801.417
Description: Funding is provided for planning, prototype manufacturing and testing of the Long Range Hypersonic Weapon. ***FY 2020 Plans:*** The Army Hypersonic Project Office worked with the Weapon System Integration Contractor to get through Systems Requirements Review and move towards a Preliminary Design Review for the system. Funding was used to order CHGBs and boosters for integration into All Up Rounds starting in Fiscal Year (FY) 2021. ***FY 2021 Plans:*** During FY 2021, LRHW will conduct a flight test (FT-3). During FY 2021, LRHW subsystems and components will continue fabrication with first articles. First articles will undergo testing and integration culminating in an initial prototype. Concurrent with LRHW prototype manufacturing, flight tests will occur to validate designs of the CHGB and booster stack. Flight test data collected will be used to anchor the system models and simulations. Prototyping of Thermal Protection System (TPS) for the glide bodies will be stood up to expand the industrial base of TPS suppliers. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The $397.417 million increase is in support of the procurement of the long lead items (LLI) for the units produced in FY 2023. It includes support to conduct FT-3. It also includes flight test support, hardware and labor for JFC-1 and ASFT-1 to be conducted in FY 2022.			
Title: FY 2020 SBIR/STTR Transfer	-	10.354	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604182A / *Hypersonics*	**Project (Number/Name)** HX1 / *Long-Range Hypersonic Weapon*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC 638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638			
Accomplishments/Planned Programs Subtotals	-	228.000	801.417

	FY 2019	FY 2020
Congressional Add: Transfer from RDTE, DW line 124 ***FY 2020 Plans:*** Transfer from RDTE, DW line 124	-	31.000
Congressional Add: Program increase ***FY 2020 Plans:*** Program increase	-	130.000
Congressional Add: Program increase - hypersonic and strategic materials and structures center of excellence ***FY 2020 Plans:*** Program increase - hypersonic and strategic materials and structures center of excellence	-	15.000
Congressional Adds Subtotals	-	176.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Army will field an experimental/prototype Hypersonic Weapons System with residual operational capability under an Urgent Materiel Release (UMR) like release NLT FY 2023 at the Battery Level as part of the Strategic Fires Battalion in support of Multi-domain Operations. CLS will be provided for one year. AHPO uses a combination of Other Transaction Authority's (OTA's) and the Navy CPS contract with Lockheed Martin.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / *Hypersonics*	Project (Number/Name) HX1 / *Long-Range Hypersonic Weapon*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Personnel and Operations Support	Various	TBD : .	-	-		24.823		30.000		-		30.000	0.000	54.823	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		10.354		-		-		-	0.000	10.354	-
		Subtotal	-	-		35.177		30.000		-		30.000	0.000	65.177	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contracts for technology development, and weapon design, integration, prototyping and testing	C/TBD	various : multiple	-	-		368.823		771.417		-		771.417	0.000	1,140.240	Continuing
		Subtotal	-	-		368.823		771.417		-		771.417	0.000	1,140.240	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		404.000		801.417		-		801.417	0.000	1,205.417	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604182A / *Hypersonics*	**Project (Number/Name)** HX1 / *Long-Range Hypersonic Weapon*

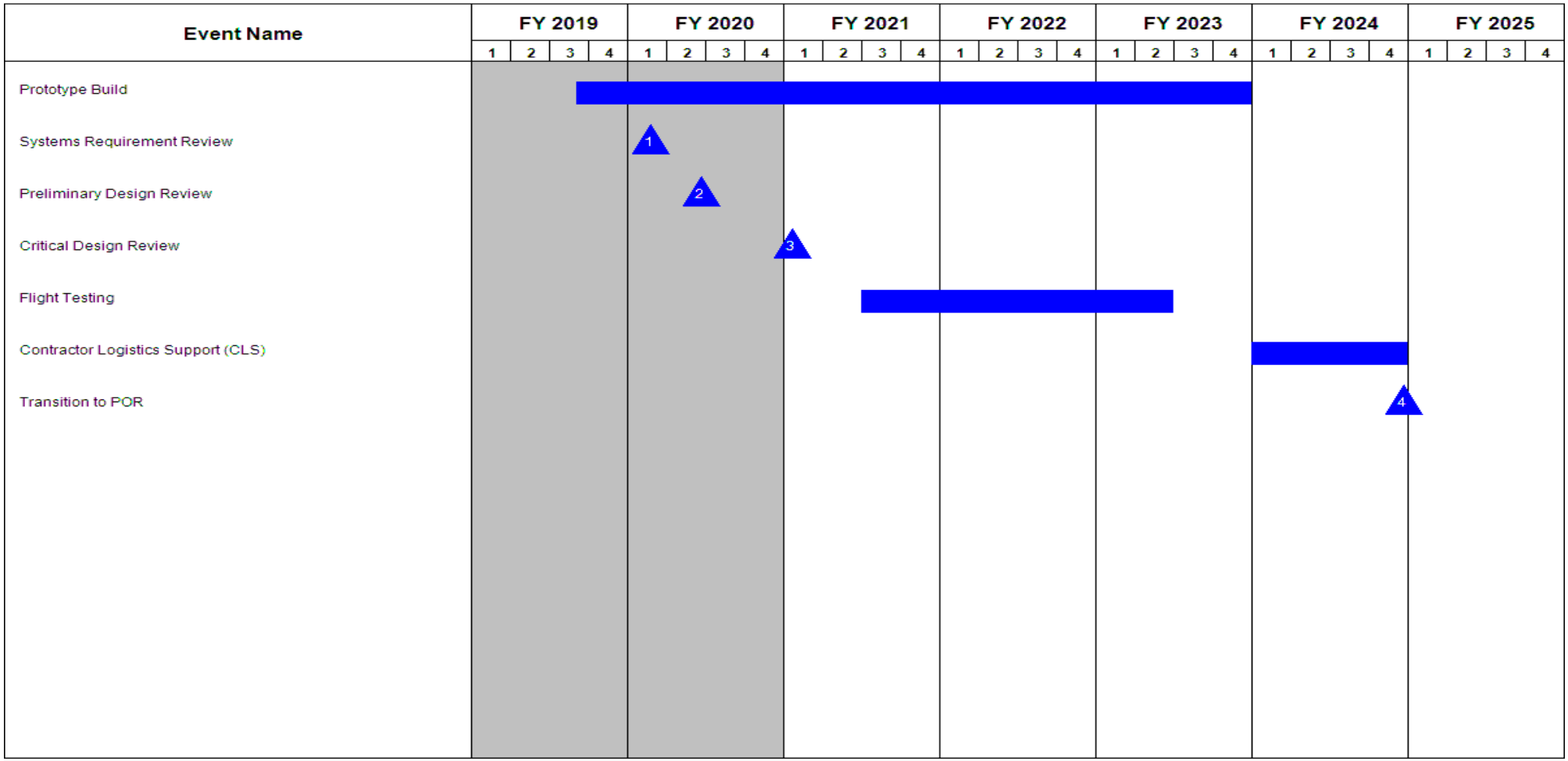

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604182A / *Hypersonics*	**Project (Number/Name)** HX1 / *Long-Range Hypersonic Weapon*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Prototype Build	3	2019	4	2023
Systems Requirement Review	1	2020	1	2020
Preliminary Design Review	2	2020	2	2020
Critical Design Review	1	2021	1	2021
Flight Testing	3	2021	2	2023
Contractor Logistics Support (CLS)	1	2024	4	2024
Transition to POR	4	2024	4	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604319A *I Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	10.324	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.324
DU3: *IFPC2*	-	10.324	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.324
Program MDAP/MAIS Code: Pre												

A. Mission Description and Budget Item Justification

The Expanded Mission Area Missile (EMAM) program supports the Integrated Air and Missile Defense (IAMD) architecture and provides Indirect Fire Protection Capability Increment 2 (IFPC Inc 2) the kinetic intercept capability to defeat Cruise Missiles (CM), Unmanned Aircraft System (UAS), and Rocket, Artillery, and Mortar (RAM) threats.

The IFPC Inc 2 will provide a ground-based weapon system designed to acquire, track, engage, and defeat the CM, UAS, and RAM threats. The IFPC Inc 2 requirement consists of a launcher, integrated fire control, sensor, and an interceptor to support the Threshold CM and UAS defeat mission and Objective counter-RAM mission with alternative kinetic and non-kinetic defeat solutions.

EMAM is no longer acting as a separate program. EMAM will be incorporated into the IFPC Inc 2 program as a potential primary interceptor for the future Enduring IFPC Inc 2 system and provide kinetic intercept capability to defeat CM, UAS and RAM threats. EMAM is now known as the IFPC Inc 2 Interceptor with strategy and funding combined with the IFPC Inc 2 program beginning in Fiscal Year (FY) 2020. The IFPC Inc 2 systems will be integrated with the Army IAMD Command and Control (C2) architecture.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	40.979	0.000	0.000	-	0.000
Current President's Budget	10.324	0.000	0.000	-	0.000
Total Adjustments	-30.655	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-30.655	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	Project (Number/Name) DU3 / *IFPC2*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
DU3: *IFPC2*	-	10.324	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.324
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Expanded Mission Area Missile (EMAM) program supports the Integrated Air and Missile Defense (IAMD) architecture and provides Indirect Fire Protection Capability Increment 2 (IFPC Inc 2) the kinetic intercept capability to defeat Cruise Missiles (CM), Unmanned Aircraft System (UAS), and Rocket, Artillery, and Mortar (RAM) threats.

The IFPC Inc 2 will provide a ground-based weapon system designed to acquire, track, engage, and defeat the CM, UAS, and RAM threats. The IFPC Inc 2 requirement consists of a launcher, integrated fire control, sensor, and an interceptor to support the Threshold CM and UAS defeat mission and Objective counter-RAM mission with alternative kinetic and non-kinetic defeat solutions.

EMAM is no longer acting as a separate program. EMAM will be incorporated into the IFPC Inc 2 program as a potential primary interceptor for the future Enduring IFPC Inc 2 system and provide kinetic intercept capability to defeat CM, UAS and RAM threats. EMAM is now known as the IFPC Inc 2 Interceptor with strategy and funding combined with the IFPC Inc 2 program beginning in Fiscal Year (FY) 2020. The IFPC Inc 2 systems will be integrated with the Army Integrated Air and Missile Defense (AIAMD) Command and Control (C2) architecture.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: System Engineering & Program Management (SEPM) ***Description:*** Funding is provided for systems engineering, integration, logistics engineering, system test and management efforts.	3.065	-	-
Title: Engineering and Technical Support ***Description:*** Funding is provided for engineering and technical support for the design of system hardware, software, and integration requirements.	1.265	-	-
Title: System/Subsystem Development and Integration ***Description:*** Funding is provided for hardware and software integration activities, technical assessments, concept studies, and integration and risk reduction.	5.631	-	-
Title: System/Subsystem Developmental Testing	0.363	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	**Project (Number/Name)** DU3 / *IFPC2*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding is provided for developmental testing activities, modeling and simulation test activities, and cyber security test activities.			
Accomplishments/Planned Programs Subtotals	10.324	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• C62002: *IFPC INC 2-I BLOCK 1 SYSTEM*	31.286	9.337	106.261	-	106.261	237.803	392.134	368.447	274.566	0.000	1,419.834

Remarks

This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.

D. Acquisition Strategy

The IFPC Inc 2 Product Office (PO) will verify technology readiness of missile alternatives in FY 2018 and will select one or more missiles to proceed in FY 2019. The PO will continue missile development, integration, and test to support Milestone B in 1 Quarter (Q) FY 2020. The program will conduct Engineering and Manufacturing Development through the end of FY 2022, Milestone C in 1Q FY 2023, and Initial Operational Test & Evaluation in FY 2023.

Formal selection is pending IAW with the senior Army leadership decision point for the Enduring IFPC Inc 2 program.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	Project (Number/Name) DU3 / *IFPC2*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Admin (IFPC Base System)	MIPR	Cruise Missile Defense Systems Project Office : Huntsville, Alabama	28.644	-		-		-		-		-	0.000	28.644	-
Program Management Admin	Various	Multiple Activities : Redstone Arsenal, Alabama	4.471	3.065	Oct 2018	-		-		-		-	0.000	7.536	-
		Subtotal	33.115	3.065		-		-		-		-	0.000	36.180	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Engineering & Integration (IFPC Base System)	MIPR	Cruise Missile Defense Systems Project Office : Huntsville, AL	54.463	-		-		-		-		-	0.000	54.463	-
System Engineering & Integration	Various	Multiple Activities : Huntsville, AL	1.600	3.210	Oct 2018	-		-		-		-	0.000	4.810	-
Engineering and Technical Support (IFPC Base System)	MIPR	Multiple Activities : Multiple Locations	140.824	-		-		-		-		-	0.000	140.824	-
Engineering and Technical Support	Various	Multiple Activities : Multiple Locations	0.200	1.265	Oct 2018	-		-		-		-	0.000	1.465	-
System/Subsystem Development and Integration (IFPC Base System)	MIPR	Multiple Activities : Multiple Locations	120.035	-		-		-		-		-	0.000	120.035	-
System/Subsystem Development and Integration	C/CPFF	TBD : Multiple Locations	4.191	2.421	Feb 2019	-		-		-		-	0.000	6.612	-
		Subtotal	321.313	6.896		-		-		-		-	0.000	328.209	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	Project (Number/Name) DU3 / *IFPC2*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System/Subsystem Developmental Testing	MIPR	Multiple Activities : Multiple Locations	0.409	0.363	Oct 2018	-		-		-		-	0.000	0.772	-
		Subtotal	0.409	0.363		-		-		-		-	0.000	0.772	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	354.837	10.324		0.000		-		-		-	0.000	365.161	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	**Project (Number/Name)** DU3 / *IFPC2*

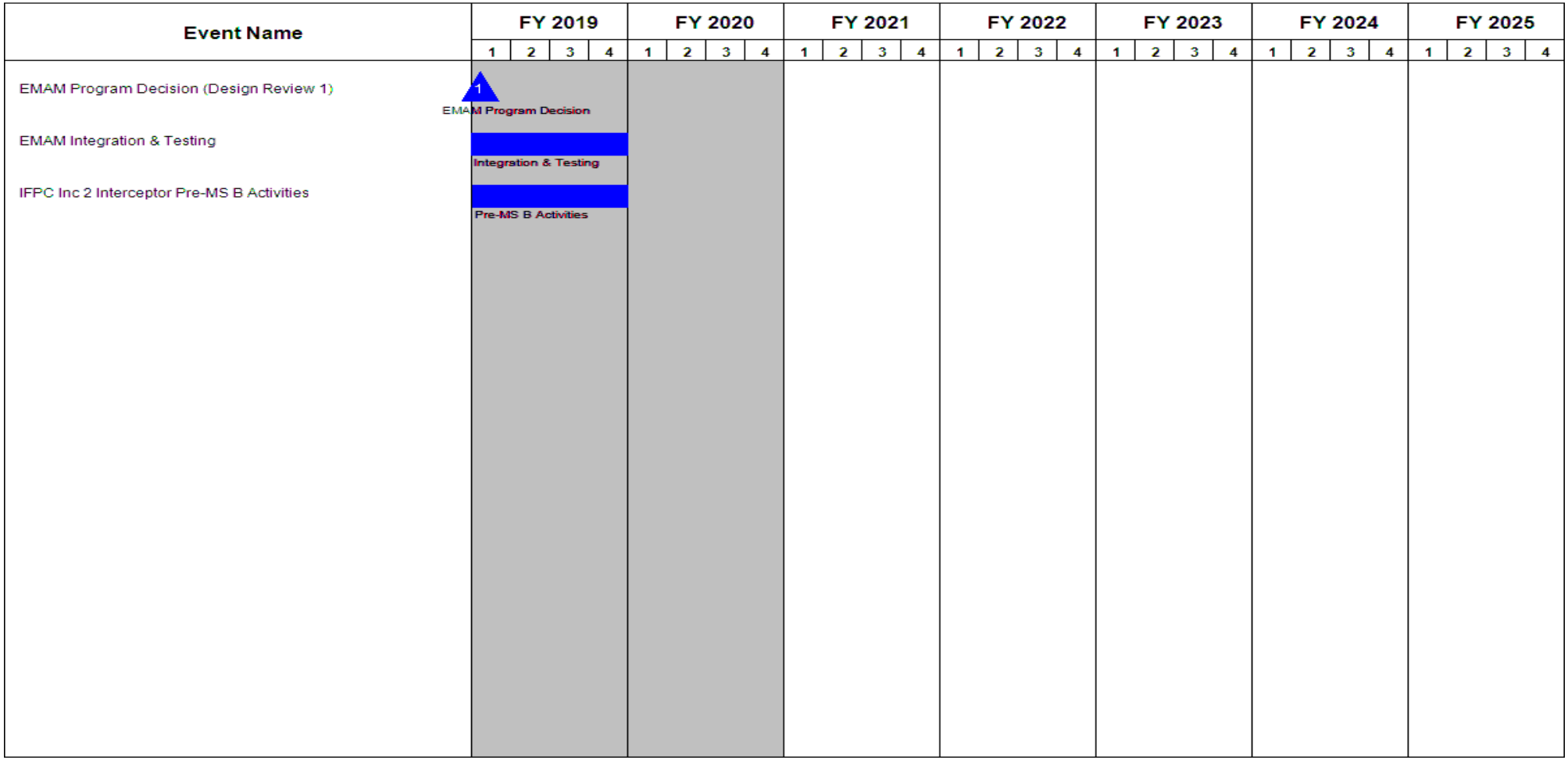

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604319A / *Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)*	**Project (Number/Name)** DU3 / *IFPC2*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Expanded Mission Area Missile (EMAM) Decision Brief	1	2017	1	2017
EMAM Program Decision (Design Review 1)	1	2019	1	2019
EMAM Integration & Testing	4	2018	4	2019
EMAM Materiel Development Decision (MDD)	4	2017	4	2017
IFPC Inc 2 Interceptor Pre-MS B Activities	1	2018	4	2019

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604403A / *Future Interceptor*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	2.000	7.992	-	7.992	7.993	7.993	7.993	7.993	Continuing	Continuing
FM3: *Future Interceptor*	-	0.000	2.000	7.992	-	7.992	7.993	7.993	7.993	7.993	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Lower Tier Future Interceptor program will provide improved operational effectiveness against evolving air, missile, and hypersonic threats within the lower tier portion of the ballistic missile defense battlespace. The future interceptor will increase Air and Missile (AMD) capability through increased velocity, altitude, and maneuverability.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	8.000	8.000	-	8.000
Current President's Budget	0.000	2.000	7.992	-	7.992
Total Adjustments	0.000	-6.000	-0.008	-	-0.008
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-6.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.008	-	-0.008

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604403A / *Future Interceptor*	Project (Number/Name) FM3 / *Future Interceptor*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FM3: *Future Interceptor*	-	0.000	2.000	7.992	-	7.992	7.993	7.993	7.993	7.993	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Lower Tier Future Interceptor program will provide improved operational effectiveness against current and evolving air, missile, and hypersonic threats within the lower tier portion of the ballistic missile defense battlespace. The future interceptor will increase Air and Missile Defense (AMD) capability through increased velocity, altitude, and maneuverability. The acquisition program will competitively select a future interceptor to complement existing Air and Missile Defense (AMD) capabilities to overmatch evolving threat.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Program Development and Support	-	1.909	7.992	-	7.992
Description: Provide program development and support for the Lower Tier Future Interceptor program, including technical work, concept definition, modeling & simulation work, and other related efforts. ***FY 2020 Plans:*** Fiscal Year (FY) 2020 Plans include: -Worked on the Competitive concept developments through Other Transaction Agreements (OTA) -Initiated Modeling & Simulation development for enhanced system effectiveness assessment ***FY 2021 Base Plans:*** -Continue execution of concept definitions through Other Transactions Agreements (OTA) -Continue Modeling & Simulation development for enhanced system effectiveness assessment -Provide program support in the development and execution of the Analysis of Alternatives (AoA) -Initiate Prototyping activities for high risk technology ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding increased and will be used to continue FY 2020 activities. Additionally, funding will be used to initiate AoA, technology prototyping, and increased management support.					
Title: FY 2020 SBIR/STTR Transfer	-	0.091	-	-	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604403A / *Future Interceptor*	**Project (Number/Name)** FM3 / *Future Interceptor*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	-	2.000	7.992	-	7.992

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• C53101: *MSE Missile*	1,131.276	702.437	603.188	176.585	779.773	765.887	1,008.835	908.799	804.295	Continuing	Continuing

Remarks

D. Acquisition Strategy

To provide improved operational effectiveness, the Army will use the Defense Ordnance Technology Consortium (DOTC) OTA to execute a competitive initial concept definition (CD) with multiple contractors. From the CD phase, rapid prototype development approaches will utilize detailed modeling and simulation of the future interceptor as well as conduct prototype development of high-risk hardware technologies. The prototype technologies and detailed simulation based interceptor design will be used to competitively down select to a single vendor. This approach and the resulting technologies and designs will inform the selection of Acquisition Strategy (traditional or 804 Middle Tier) most advantageous for this project. This PB21 submission presents R-4 and R-4a schedule information in traditional acquisition terminology that will be updated with 804 Middle Tier terminology if utilized.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604403A / *Future Interceptor*	Project (Number/Name) FM3 / *Future Interceptor*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PAC-3 Product Office	MIPR	Project Office : Huntsville, AL	-	-		-		0.350	Dec 2020	-		0.350	0.000	0.350	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.091		-		-		-	0.000	0.091	-
		Subtotal	-	-		0.091		0.350		-		0.350	0.000	0.441	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SETA	Various	Multiple : Multiple	-	-		-		0.900	Feb 2021	-		0.900	0.000	0.900	Continuing
US Other Government Agencies (OGA)	MIPR	Various : Huntsville, AL	-	-		1.909	Jan 2020	6.742	Feb 2021	-		6.742	0.000	8.651	Continuing
		Subtotal	-	-		1.909		7.642		-		7.642	0.000	9.551	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.000		7.992		-		7.992	0.000	9.992	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604403A / *Future Interceptor*	**Project (Number/Name)** FM3 / *Future Interceptor*

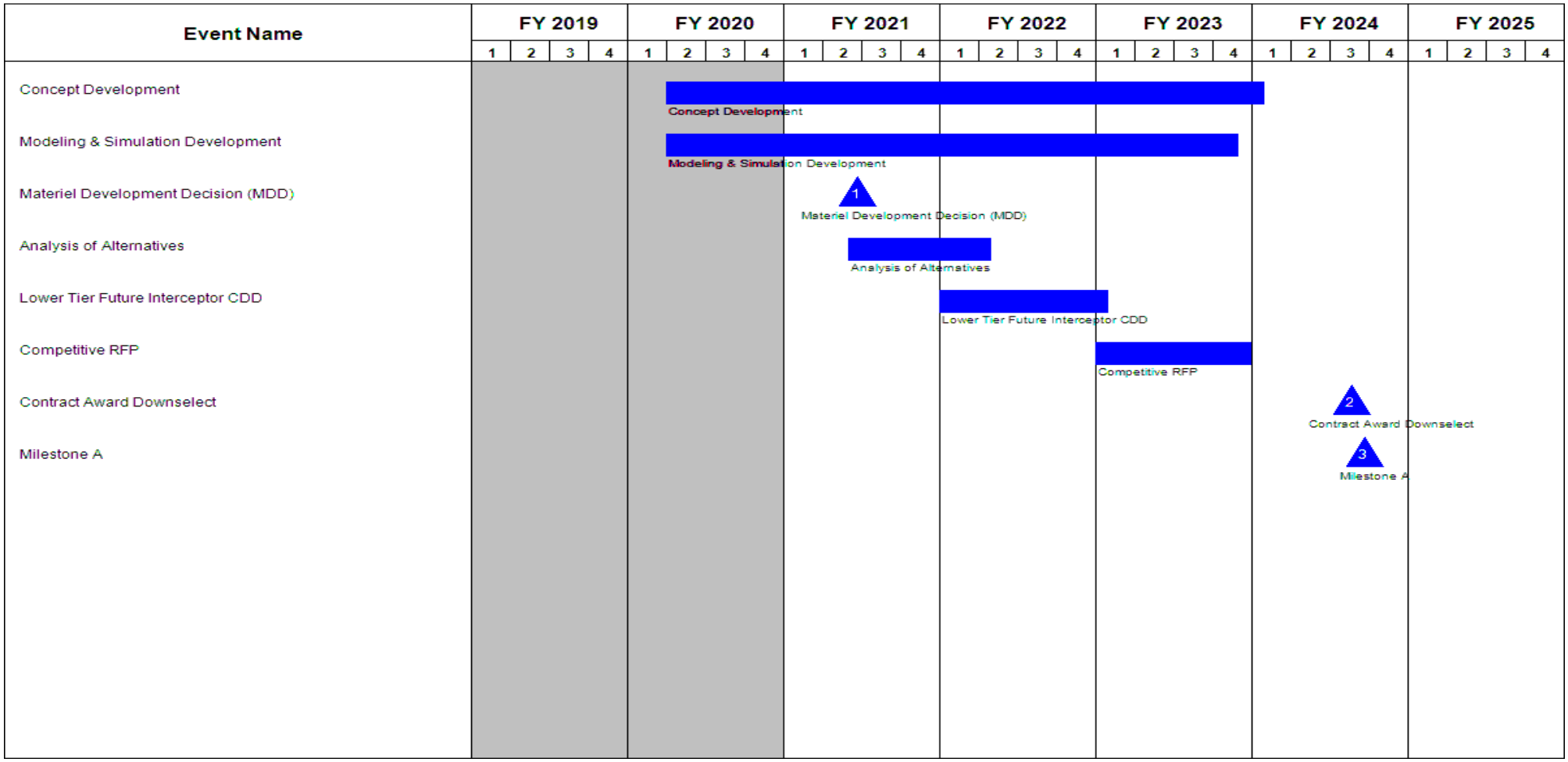

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604403A / *Future Interceptor*	**Project (Number/Name)** FM3 / *Future Interceptor*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Concept Development	2	2020	1	2024
Modeling & Simulation Development	2	2020	4	2023
Materiel Development Decision (MDD)	2	2021	2	2021
Analysis of Alternatives	2	2021	2	2022
Lower Tier Future Interceptor CDD	1	2022	1	2023
Competitive RFP	1	2023	4	2023
Contract Award Downselect	3	2024	3	2024
Milestone A	3	2024	3	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	29.700	40.677	-	40.677	40.924	41.204	41.219	41.422	Continuing	Continuing
BT1: *Interoperability*	-	0.000	5.175	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.175
BT2: *Command Post Mobility/ Survivability*	-	0.000	5.550	9.728	-	9.728	9.729	9.729	9.729	9.729	Continuing	Continuing
BT3: *Common Operating Environment (COE)*	-	0.000	4.350	8.164	-	8.164	8.169	8.176	8.180	8.192	Continuing	Continuing
BT4: *Network Technology Maturation Initiatives (NTMI)*	-	0.000	2.400	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.400
BT5: *Integrated Tactical Network/Enterprise Network*	-	0.000	12.225	22.785	-	22.785	23.026	23.299	23.310	23.501	Continuing	Continuing

Note

Funds supporting CFT Network efforts were previously requested in program Cross Functional Team (CFT) Advanced Development & Prototyping, OSD PE 0604020A.

A. Mission Description and Budget Item Justification

Unified Network Transport is directly aligned to the Army Network Modernization Strategy LOE 1 Unified Network; LOE 2, Common Operating Environment (COE), LOE 3, Interoperability; and LOE 4, Command Post Mobility and Survivability. These efforts support advanced component development activities that are aligned to the Army's Tactical Network Capability Set development and fielding plans.

The Network Cross-Functional Team (N-CFT) engages in technology demonstrations, focused evaluations, and expert analysis to inform future requirements, mature technologies, and deliver new capabilities. Subsequent to a decision for materiel development, the N-CFT develops and refines capability documentation aligned with the appropriate transition approach. The N-CFT will inform technology transitions, research and development, and user assessments, and then rapidly transition to appropriate Programs of Record.

FY 2021 funds will support identification, maturation, demonstration, and evaluation of Technology Readiness Level (TRL) 6+ systems and subsystem components including, but not limited to, resilient Line of Site (LOS) and beyond Line of Sight (BLOS) communications, information systems and information management; cyber electromagnetic activities (CEMA) situational understanding and operations; intelligence fusion, cloud technologies, virtual augmentation, artificial intelligence, and data convergence and analytics in the Common Operating Environment to inform the Integrated Tactical Network/Enterprise Network and Enabling Functions, Computing Environments, Interoperability and Command Posts. Successful solutions identified through evaluation in a high fidelity and realistic operating environment will be transitioned to Programs of Record for integration and fielding. Funds will also support integration with solutions identified in the other Modernization CFT efforts to ensure network dependencies are addressed.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*		R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*			
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	0.000	39.600	41.400	-	41.400
Current President's Budget	0.000	29.700	40.677	-	40.677
Total Adjustments	0.000	-9.900	-0.723	-	-0.723
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-9.900			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.723	-	-0.723

Change Summary Explanation

N/A: FY20 New Start Program

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT1 / *Interoperability*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BT1: *Interoperability*	-	0.000	5.175	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.175
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Interoperability is directly aligned to the Army Network Modernization Strategy LOE 1 and 2, Unified Network Transport and Common Operating Environment, respectively. These efforts support advanced component development activities that are aligned to the Army's Tactical Network Capability Set development and fielding plans.

The project enables Unified Action Partner Interoperability through integration into the Joint Information Environment (JIE) and the Mission Partner Environment (MPE). Interoperability is the ability to routinely act together coherently, effectively and efficiently to achieve tactical, operational, and strategic objectives. Interoperability between disparate forces allows coalitions to produce greater combat power than the sum of their parts by leveraging relative strengths while mitigating relative weaknesses.

Funding is used for technical maturation and evaluation of technologies to address gaps associated with LOE 3, Interoperability, solutions that will incorporate common commercial standards and/or widely recognized military interoperability standards. This funding will support demonstrations and experimentation, in a relevant operational environment, of key research and development (R&D) and science and technology (S&T) initiatives related to this effort, to include communications, information systems and information management; intelligence, surveillance and reconnaissance; intelligence fusion and digital fires.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: BT1: Interoperability	-	4.940	-
Description: This funding is used to identify and acquire technologies to address gaps associated with LOE 3, Interoperability, solutions for evaluation that will incorporate abilities to leverage common commercial standards and/ or widely recognized military interoperability standards. This funding will support demonstrations and evaluations, in a relevant operational environment, of key research and development (R&D) and science and technology (S&T) initiatives related to interoperability, to include communications, information systems and information management; intelligence, surveillance and reconnaissance; intelligence fusion and digital fires. ***FY 2020 Plans:*** FY 2020 funding initiates assessment of Unified Action Partners (UAPs) to determine levels of interoperability and integrate requirements by echelon, unit type and partner. Also, this funding initiates identifying multiple classification levels and access on Mission Partner Environment (MPE) solutions for evaluation. FY20 funding supports joint interoperability assessments during available user exercises such as, but not limited to: Joint Warfighter Assessment 20 and DEFENDER 20. Funding enables the Army to identify potential solutions for the following: enabling technologies to support the Army operating in an MPE; a deployed			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT1 / *Interoperability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Army solution to extend episodic MPEs into the tactical network; and implementing solutions to UAP information exchange gaps (data, message and waveform Interoperability). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding realigned to BT5 and BT3 to better align Interoperability objectives within Integrated Tactical/Enterprise Network and Common Operating Environment efforts.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.235	-
Accomplishments/Planned Programs Subtotals	-	5.175	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Network CFT will coordinate on technologies to be evaluated with appropriate Program Management offices where there is an opportunity for technology insertion. Technologies that are determined to address technology gaps and require further evaluation will be documented in an acquisition decision memorandum after being approved by the Milestone Decision Authority. The various prototyping technologies will be pursued via competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT1 / *Interoperability*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Management Office Support	TBD	TBD : TBD	-	-		0.441	Mar 2020	-		-		-	0.000	0.441	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.235		-		-		-	0.000	0.235	-
		Subtotal	-	-		0.676		-		-		-	0.000	0.676	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM (Technical Exchange Meeting) Prototyping and Evaluations	TBD	TBD : TBD	-	-		3.117	Jul 2020	-		-		-	0.000	3.117	-
		Subtotal	-	-		3.117		-		-		-	0.000	3.117	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Engineering and Technical Support	TBD	CCDC C5ISR : APG, MD	-	-		0.691	Mar 2020	-		-		-	0.000	0.691	-
		Subtotal	-	-		0.691		-		-		-	0.000	0.691	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Test and Evaluation	TBD	CCDC : C5ISR, PEO C3T : APG, MD	-	-		0.691	Mar 2020	-		-		-	0.000	0.691	-
		Subtotal	-	-		0.691		-		-		-	0.000	0.691	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT1 / *Interoperability*	

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		5.175		-		-		-	0.000	5.175	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT1 / *Interoperability*

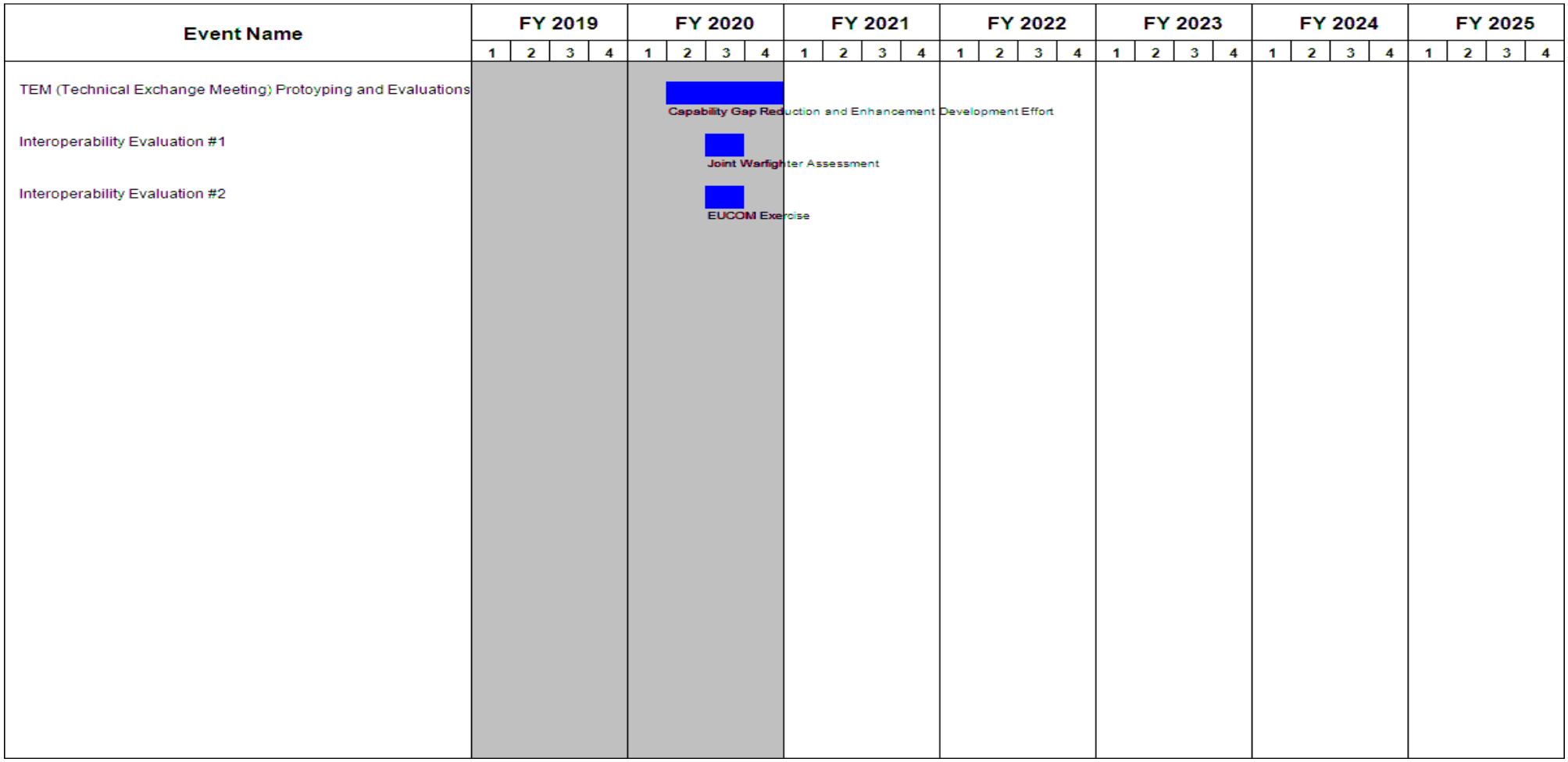

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT1 / *Interoperability*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
TEM (Technical Exchange Meeting) Protoyping and Evaluations	2	2020	4	2020
Interoperability Evaluation #1	3	2020	3	2020
Interoperability Evaluation #2	3	2020	3	2020

Note

TEM projects are continuous activities; N-CFT will reach out to industry partners in order to assess and demonstrate the latest emerging technologies which will reduce capability gaps and provide rapid software/hardware insertions into Programs of Record.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT2 / *Command Post Mobility/Survivability*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BT2: *Command Post Mobility/ Survivability*	-	0.000	5.550	9.728	-	9.728	9.729	9.729	9.729	9.729	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Command Post Mobility/Survivability is directly aligned to the Army Network Modernization Strategy LOE4, Command Post Mobility and Survivability . These efforts support advanced component development activities that are directly aligned to the Army's Tactical Network Capability Set development and fielding plans.

This project supports mobile Command Post efforts and is directly aligned with the Command Post Integrated Infrastructure (CPI2). The technical maturation and evaluation allow for Command Post disaggregation capabilities to inform future designs. Spectrum obfuscation and assessments of antenna remoting will support the Command Post efforts for CPI2 Increment 2 and beyond.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: BT2 Command Post Mobility and Survivability	-	5.298	9.728
Description: This funding is used to identify and acquire technologies for evaluation that address gaps associated with LOE 4, Command Post (CP), in the overall Integrated Tactical Network. The CP LOE will focus on developing and obtaining approval of requirements for integrated command posts, then delivering these integrated command post designs to Army units. LOE 4 addresses the operational requirement of Deployable, Integrated, and Mobile Command Post and integrates Knowledge Management. ***FY 2020 Plans:*** FY 2020 funding initiates survivable command post solutions that enable dispersed Command Post (CP) footprint, reduced CP Electromagnetic vulnerability, and extensible CP decoys for deception. Also, subsequent funding will support evaluations that identify potential solutions for the following: Expeditionary tactical servers, integrated roll-on/roll-off kits, automated management and monitoring software to provision and manage command post; enhanced hardware operating at multiple classification levels pending availability of cross domain solution; technology enhancements addressing gaps discovered through the delivery of CP Directed Requirement capabilities, and the development and delivery of Integrated CP Designs that provide agility, mobility, and protection. Technologies with successful results will be transitioned into an existing Program of Record strategy for integration and fielding. ***FY 2021 Plans:*** Funds will be used to mature, prototype, and evaluate emerging technologies that will inform design choices for the Command Post Integrated Infrastructure (CPI2) Increment 2 and beyond. Effort includes evaluation for tactically employable Command Post (CP) disaggregation capabilities, will also allow for the integration of spectrum obfuscation modes of employment for limited			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT2 / *Command Post Mobility/Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
radio frequency emissions capabilities into a tactically deployable CP and assess antenna remoting solutions, and will enable integration of Mission Partner Environment hardware components into the CP. These efforts will be demonstrated and evaluated with FORSCOM and inform the program technical baseline and DOTMLPF. Will conduct iterative Technical Exchange Meetings with Industry that will assess, demonstrate, prototype, and integrate emerging industry solutions to mature Command Post capabilities. Efforts will inform the requirements for a survivable and effective mobile Command Post in a contested and congested environment. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase due to partial realignment of funding from BT1 to align Interoperability within Command Post Mobility/Survivability efforts and provide additional evaluations of the capability set roadmap.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.252	-
Accomplishments/Planned Programs Subtotals	-	5.550	9.728

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Network CFT will coordinate on technologies to be evaluated with appropriate Program Management offices where there is an opportunity for technology insertion. Technologies that are determined to address technology gaps and require further evaluation will be documented in an acquisition decision memorandum after being approved by the Milestone Decision Authority. The various evaluations and prototyping of technologies will be pursued via competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT2 / *Command Post Mobility/Survivability*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		0.437	Oct 2020	-		-		-	0.000	0.437	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.252		-		-		-	0.000	0.252	-
		Subtotal	-	-		0.689		-		-		-	0.000	0.689	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM (Technical Exchange Meeting) Prototyping and Evaluations	TBD	TBD : TBD	-	-		3.637	Jul 2020	-		-		-	0.000	3.637	-
Commercially-driven Prototyping and Evaluation	TBD	TBD : TBD	-	-		-		4.428	Feb 2021	-		4.428	0.000	4.428	-
Government-driven Prototyping and Evaluation	TBD	CCDC C5ISR; PEO C3T : APG, MD	-	-		-		5.300	Dec 2020	-		5.300	0.000	5.300	-
		Subtotal	-	-		3.637		9.728		-		9.728	0.000	13.365	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CP Engineering/Technical Support	TBD	TBD : TBD	-	-		0.687	Jul 2020	-		-		-	0.000	0.687	-
		Subtotal	-	-		0.687		-		-		-	0.000	0.687	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CP Test and Evaluation	TBD	TBD : TBD	-	-		0.537	Jul 2020	-		-		-	0.000	0.537	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT2 / *Command Post Mobility/Survivability*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			-	-		0.537		-		-		-	0.000	0.537	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		5.550		9.728		-		9.728	0.000	15.278	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT2 / *Command Post Mobility/Survivability*

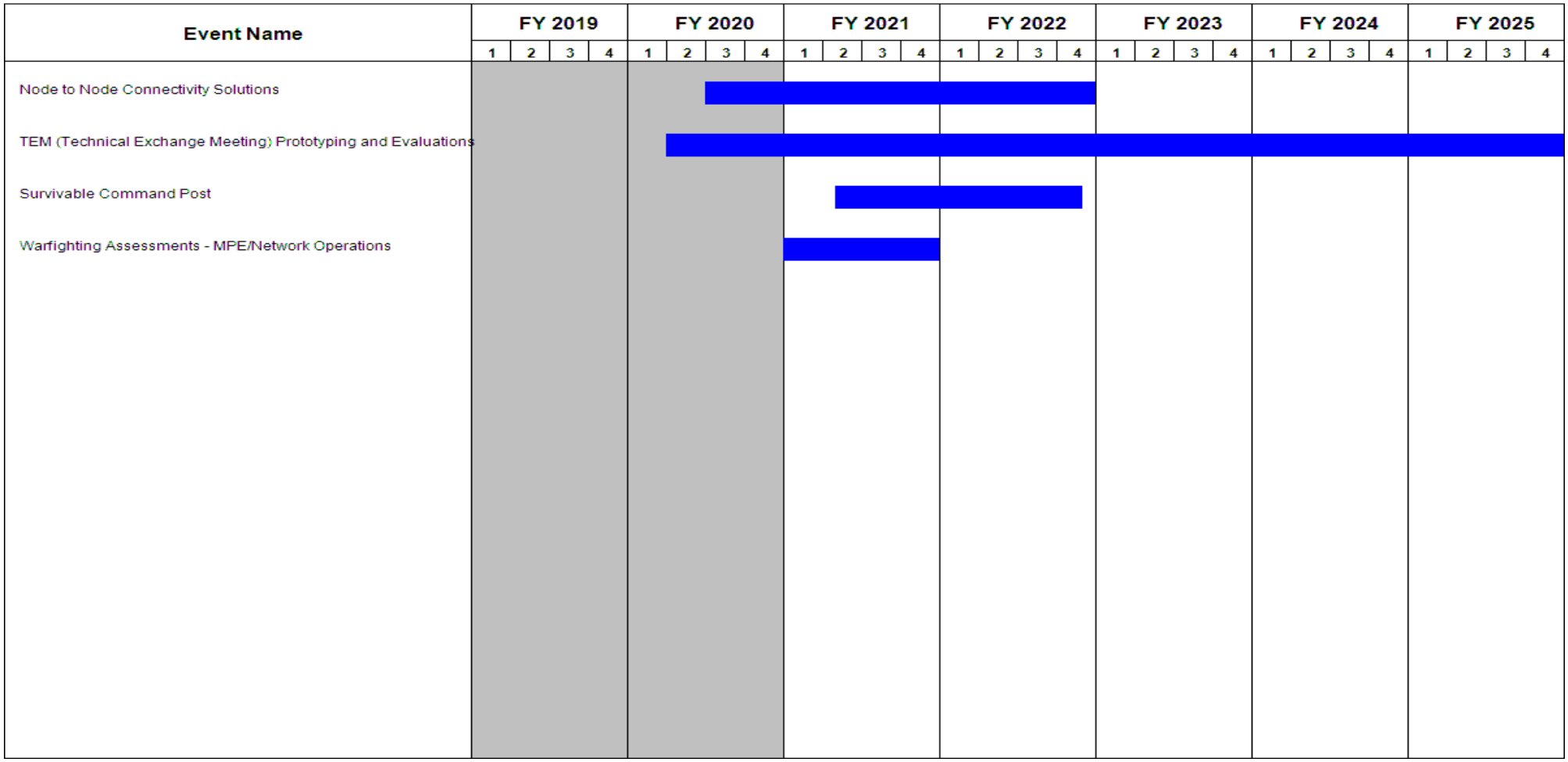

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT2 / *Command Post Mobility/Survivability*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Node to Node Connectivity Solutions	3	2020	4	2022
TEM (Technical Exchange Meeting) Prototyping and Evaluations	2	2020	4	2025
Survivable Command Post	2	2021	4	2022
Warfighting Assessments - MPE/Network Operations	1	2021	4	2021

Note

TEM projects are continuous activities; N-CFT will reach out to industry partners in order to assess and demonstrate the latest emerging technologies which will reduce capability gaps and provide rapid software/hardware insertions into Programs of Records.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT3 / *Common Operating Environment (COE)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BT3: *Common Operating Environment (COE)*	-	0.000	4.350	8.164	-	8.164	8.169	8.176	8.180	8.192	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Common Operating Environment (COE) is directly aligned to the Army Network Modernization Strategy LOE 2, Common Operating Environment (COE). These efforts support advanced component development activities that are aligned to the Army's Tactical Network Capability Set development and fielding plans.

This project will inform future network, applications and data capability sets by evaluating and maturing the use of cloud technologies, virtual augmentation, artificial intelligence,data convergence and analytics in the Common Operating Environment. This includes processing and storage to improve the architecture support for mobile, secure and distributed operations. Common Operating Environment (COE), creates an approved set of standards, computing technologies, integrated data and databases, common graphics and a unified set of mission command applications. It allows warfighters to adapt and configure the network as conditions change which is outlined in the approved COE requirements documents.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: BT3 Common Operating Environment	-	4.153	8.164
Description: This funding is used to identify and acquire technologies to address gaps associated with LOE 2, Common Operating Environment (COE), in the overall Integrated Network. This LOE creates an approved set of standards, computing technologies, integrated data and databases and common graphics and a unified set of mission command applications. It will also support collaboration using a common picture with joint and coalition mission partners. This LOE delivers an integrated body of requirements that meet operational needs. The decisive action within this LOE is informing the next version of COE in FY 2021.			
FY 2020 Plans: FY 2020 funding supports assessment and evaluation of potential solutions for the following: distributed computing, using cloud technologies in a tactical space, machine learning, a modular & dockable computing infrastructure, and cyber hardening through Tactical Endpoint Security. Technologies with successful results will be transitioned to a rapid acquisition initiative or into an existing Program of Record strategy.			
FY 2021 Plans: Will support evaluation of mature technologies that capture, correlate, and present data from available sources such as spectrum, electronic warfare (EW), red and gray space for visualization for cyber situational understanding. Will assess and evaluate the technical feasibility of solutions for expanded computing in tactical environments, data convergence, sensor integration across identified platforms, and flexible and scalable computing hardware/software. Will enable commanders to visualize, understand,			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT3 / *Common Operating Environment (COE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
describe, and assess complex problems rapidly. Will conduct iterative Technical Exchange Meetings to find Industry potential solutions to assess, demonstrate, prototype, and integrate emerging industry solutions to mature Common Operating Environment capabilities. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase due to partial realignment of funding from BT1 to align Interoperability within Common Operating Environment efforts.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.197	-
Accomplishments/Planned Programs Subtotals	-	4.350	8.164

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Network CFT will coordinate on technologies to be evaluated with appropriate Program Management offices where there is an opportunity for technology insertion. Technologies that are determined to address technology gaps and require further evaluation will be documented in an acquisition decision memorandum after being approved by the Milestone Decision Authority. The prototyping technologies in this project will be pursued via competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT3 / *Common Operating Environment (COE)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		0.451	Mar 2020	-		-		-	0.000	0.451	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.197		-		-		-	0.000	0.197	-
		Subtotal	-	-		0.648		-		-		-	0.000	0.648	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM (Technical Exchange Meeting) Prototyping and Evaluations	TBD	TBD : TBD	-	-		2.700	Jul 2020	-		-		-	0.000	2.700	-
Commercially-driven Prototyping and Evaluation	TBD	TBD : TBD	-	-		-		7.164	Feb 2021	-		7.164	0.000	7.164	-
Government-driven Prototyping and Evaluation	TBD	CCDC C5ISR, PEO C3T : APG, MD	-	-		-		1.000	Dec 2020	-		1.000	0.000	1.000	-
		Subtotal	-	-		2.700		8.164		-		8.164	0.000	10.864	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
COE Engineering/ Technical Support	TBD	TBD : TBD	-	-		0.451	Mar 2020	-		-		-	0.000	0.451	-
		Subtotal	-	-		0.451		-		-		-	0.000	0.451	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT3 / *Common Operating Environment (COE)*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
COE Test and Evaluation	TBD	TBD : TBD	-	-		0.551	Sep 2020	-		-		-	0.000	0.551	-
		Subtotal	-	-		0.551		-		-		-	0.000	0.551	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		4.350		8.164		-		8.164	0.000	12.514	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT3 / *Common Operating Environment (COE)*

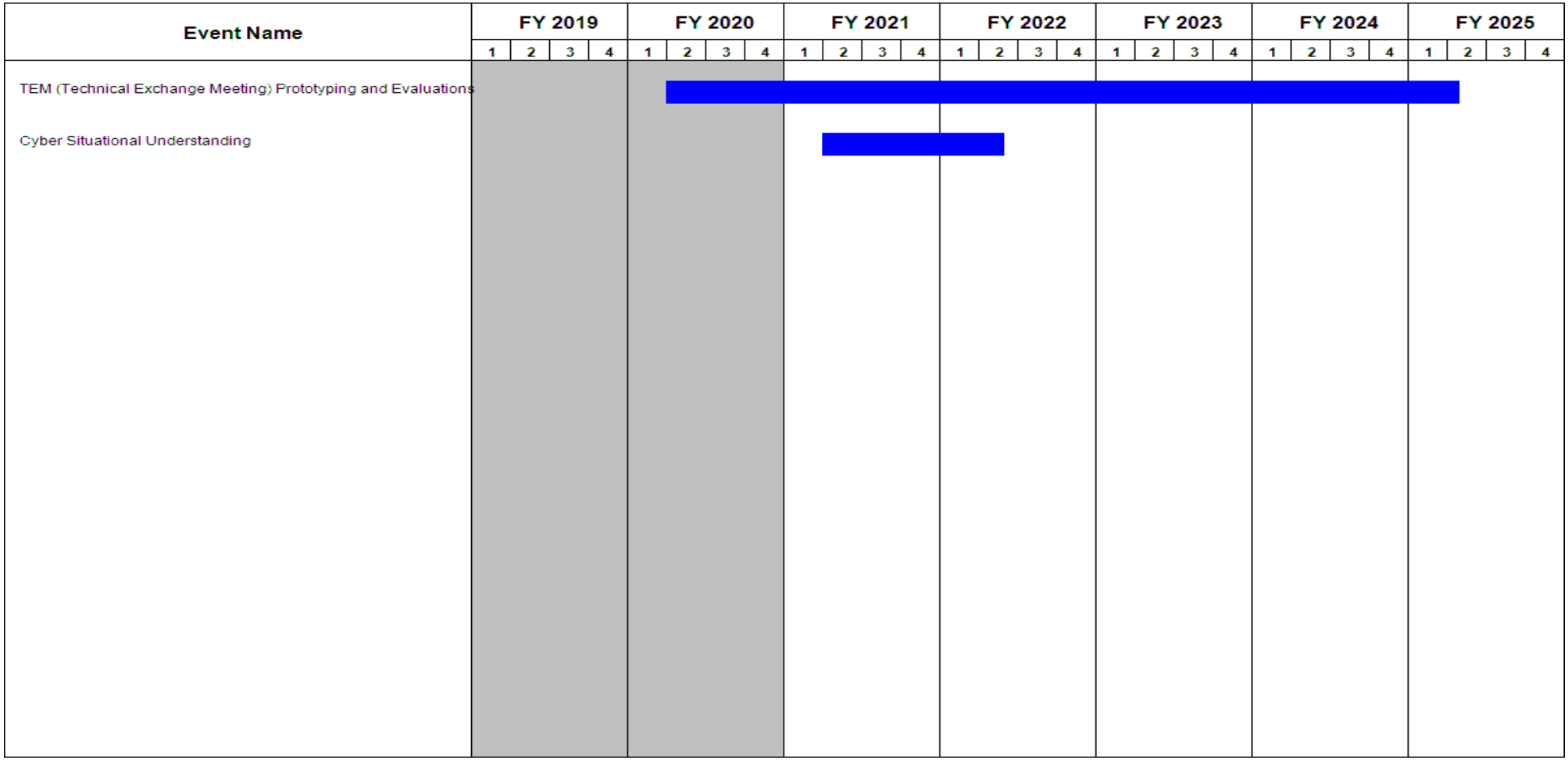

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT3 / *Common Operating Environment (COE)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
TEM (Technical Exchange Meeting) Prototyping and Evaluations	2	2020	2	2025
Cyber Situational Understanding	2	2021	2	2022

Note

TEM projects are continuous activities; N-CFT will reach out to industry partners in order to assess and demonstrate the latest emerging technologies which will reduce capability gaps and provide rapid software/hardware insertions into Programs of Record.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT4 / *Network Technology Maturation Initiatives (NTMI)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BT4: *Network Technology Maturation Initiatives (NTMI)*	-	0.000	2.400	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.400
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2021 funding realigned to BT5 to reflect alignment with Integrated Tactical / Enterprise Network.

A. Mission Description and Budget Item Justification

This project is directly aligned to the Army Network Modernization Strategy Lines of Effort and Capability Set 23 objectives and beyond.

This project funding will mature solutions through evaluation from non-Army organizations that include the Services, Academia and other science and technology organizations. The lab-based and operational field evaluation and assessments will support the Army's use of technologies to support Joint collaboration and coordination of transport, network and data classification, visualization for Situational Understanding, CEMA, and artificial intelligence for Capability Set 23 and beyond. This includes evaluation and prototyping of mature algorithms/systems to support Joint and Coalition data sharing for Mission Command/Intel convergence, sensor to shooter cycles and Joint Multi-Domain Command and Control.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: BT4: Network Technology Maturation Initiatives (NTMI) ***Description:*** This funding will be used to continuously identify, prioritize, mature, demonstrate, and insert emerging technologies to enhance operational capability through our Market Research and Concept Capability Development activities. Funding provides engineering and programmatic support required for execution of lab-based and field prototyping and evaluation. ***FY 2020 Plans:*** This funding provides support required to identify successful solutions for transition into the tactical network through programs of record. FY 2020 funding supports lab-based and field evaluation of Government and Commercial solutions and solutions derived from mature Network Transport initiatives from Industry, the Services, and/or the Office of the Secretary of Defense. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding realigned to BT5 to reflect alignment with Integrated Tactical / Enterprise Network.	-	2.291	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	0.109	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT4 / *Network Technology Maturation Initiatives (NTMI)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	2.400	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The various evaluations and prototyping of technologies will be pursued via competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT4 / *Network Technology Maturation Initiatives (NTMI)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		0.214	Mar 2020	-		-		-	0.000	0.214	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.109		-		-		-	0.000	0.109	-
		Subtotal	-	-		0.323		-		-		-	0.000	0.323	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NTMI Engineering/ Technical Support	TBD	TBD : TBD	-	-		1.713	Apr 2020	-		-		-	0.000	1.713	-
		Subtotal	-	-		1.713		-		-		-	0.000	1.713	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NTMI Test and Evaluation	TBD	TBD : TBD	-	-		0.364	Jun 2020	-		-		-	0.000	0.364	-
		Subtotal	-	-		0.364		-		-		-	0.000	0.364	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.400		-		-		-	0.000	2.400	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT4 / *Network Technology Maturation Initiatives (NTMI)*

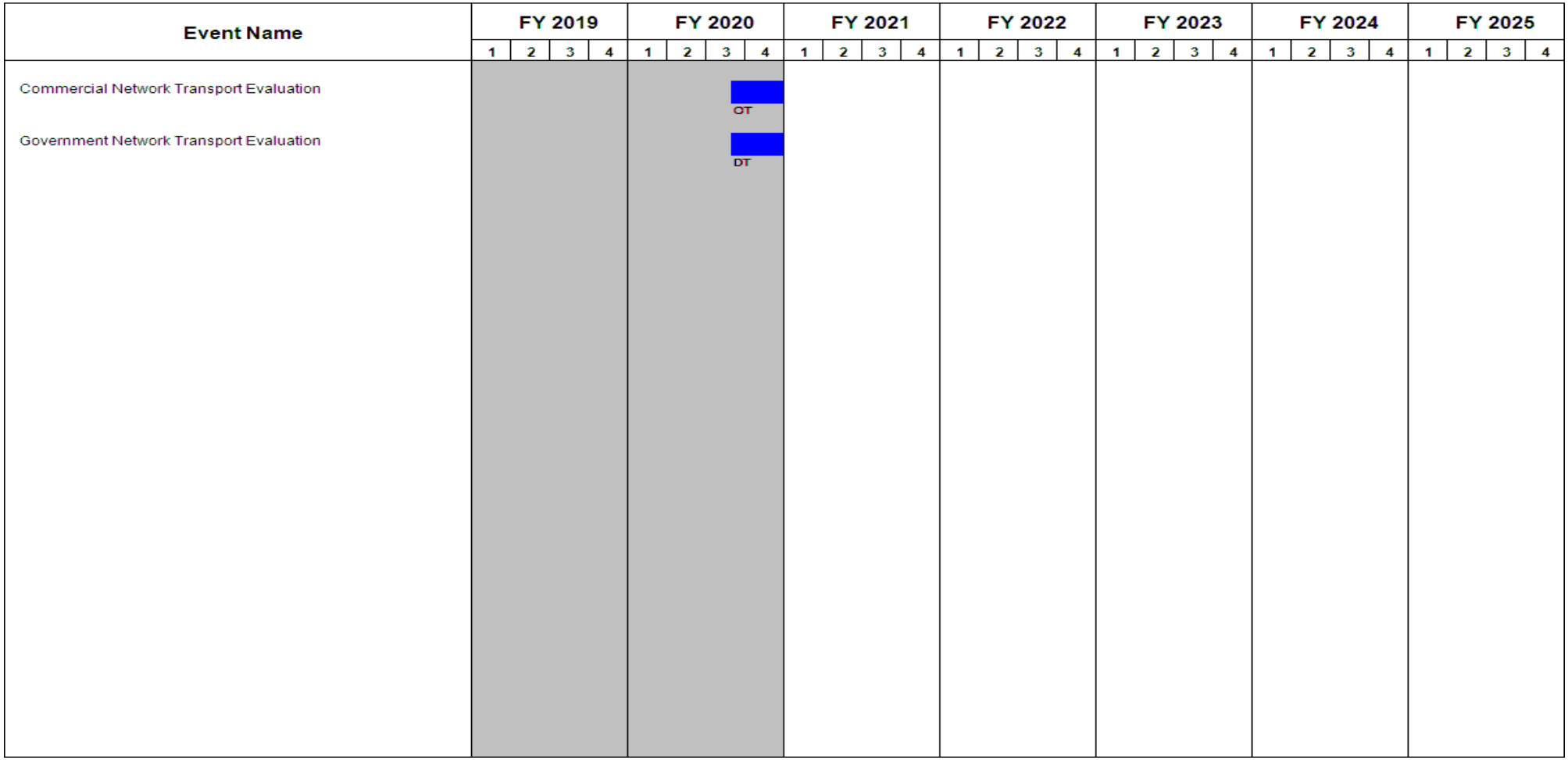

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT4 / *Network Technology Maturation Initiatives (NTMI)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Commercial Network Transport Evaluation	3	2020	4	2020
Government Network Transport Evaluation	3	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT5 / *Integrated Tactical Network/Enterprise Network*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BT5: *Integrated Tactical Network/Enterprise Network*	-	0.000	12.225	22.785	-	22.785	23.026	23.299	23.310	23.501	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Integrated Tactical Network/Enterprise Network is directly aligned to the Army Network Modernization Strategy LOE 1 Unified Network. These efforts support advanced component development activities that are aligned to the Army's Tactical Network Capability Set development and fielding plans.

This funding will inform design decisions for future tactical network capability sets in the areas of Aerial Tier, LEO, MEO, GEO high throughput satellite capabilities, cyber hardened communications, and resilient Line of Site (LOS) and beyond Line of Sight (BLOS) waveforms through evaluation and technical maturation. It will increase bandwidth and range; improve mobility and network security; harden the network and support interoperability with Joint and Unified Action Partners.

This project enables a converged Mission Command Network that operates seamlessly worldwide and in any environment. It includes the development of a standards-based network architecture that unifies enterprise and deployed network capabilities and features a unified transport layer, network operations and other enabling functions that allows integration of disparate networks. The Army network will provide resiliency through path diversity and dynamic routing to ensure tactical units can communicate in hostile environments. It will provide multiple ways to communicate and give commanders the ability to choose their communications methods and tools during operations. It fully incorporates cyber and electronic warfare capabilities that support the employment of the network as a weapon system. The ITN/IEN enables Unified Action Partner Interoperability through integration into the Joint Information Environment (JIE) and the Mission Partner Environment (MPE). Interoperability is the ability to routinely act together coherently, effectively and efficiently to achieve tactical, operational, and strategic objectives. Interoperability between disparate forces allows coalitions to produce greater combat power than the sum of their parts by leveraging relative strengths while mitigating relative weaknesses.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Project BT5: Integrated Tactical Network/Integrated Enterprise Network	-	11.670	22.785
Description: This funding is used to identify and acquire technologies to address gaps associated with LOE 1, Unified Network, for evaluation and demonstration in the overall Integrated Network. The Unified Network LOE enables a converged Mission Command Network that operates seamlessly worldwide and in any environment. This will require the creation of a standards-based network architecture that effectively integrates enterprise and deployed network capabilities across domains and environments, and features a unified transport layer that permits "plug and play" for specific network capabilities. LOE 1 addresses the following operational requirements: Converged Mission Command Network, Network Augmentation / Extension, and Synthetic Training Environment.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT5 / *Integrated Tactical Network/Enterprise Network*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2020 funding supports identifying solutions for network fail-over in a contested environment to enable PACE (Primary, Alternate Contingency & Emergency) and demonstrate rapid restoration capability for a denied WGS NCW tactical communications network which supports BLOS communications between Division, Brigade, Battalion and Company echelons with high altitude balloon satellite surrogates. Restoring the NCW network provides resiliency to communications, including LRPF. Also, this funding supports demonstration and acquisition plans for evaluation of potential solutions for the following: Accelerate Next Generation Tactical radio, Air to ground integration, Secure LTE capabilities for mounted/ dismounted soldiers, and Tactical Network Operations (NetOps), Cyber Electromagnetic Activities (CEMA) and Tactical Identity and Access Management (IdAM). Technology enhancements will provide Integrated Multi-Transport Capabilities, High Capacity Line of Sight Backhaul Radios, Line Of Sight Communications Range Extension, Electronic Protection of Tactical Communications, Network Gateways,Tactical NetOps Tools, Distributed Computing Tools, and High Capacity Transport for Heavy Mobile Platforms. Technologies with successful results will be transitioned to a rapid acquisition initiative or an existing Program of Record strategy for integration and fielding. ***FY 2021 Plans:*** Will prototype and evaluate Army science and technology solutions in order to support approved requirements documents and critical network modernization efforts to accelerate Next Generation Tactical radios, Air to ground integration, Secure LTE capabilities for mounted/ dismounted soldiers and solutions for a hardened, resilient network. Will evaluate artificial intelligence and other advanced solutions for communications network processing, transport, and operations to support resiliency in a contested and congested environment. This includes evaluating and prototyping with emerging technology solutions for communications for tactical and strategic Army assets in satellite denied, area denied environments and increase immunity to enemy detection and interception. Funding will allow the Army to identify and prototype solutions to mature the network transport and gateway components of the Mission Partner Environment (MPE) and share network operations information through warfighting assessments and evaluations that will inform Capability Set 23 and beyond. Will conduct iterative Technical Exchange Meetings with Industry and non-Army organizations such as other Services, DARPA, NSA, OSD, FFRDs, and Academia to assess, demonstrate, prototype, and integrate emerging industry solutions to mature unified network capabilities to include integration of government and commercial Low Earth Orbit (LEO), Mid Earth Orbit (MEO) and Geosynchronous Earth Orbit (GEO) high throughput satellite communications. Will reduce capability gaps and provide rapid software/hardware insertions for Programs of Record. These efforts directly support the Army's tactical network acquisition strategy roadmap submitted to Congress. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Increase due to realignment of funding from BT4 and partial realignment of BT1 to better align Interoperability objectives within Integrated Tactical Network / Enterprise Network and support higher Integrated Tactical Network / Enterprise Network priorities.			
Title: FY 2020 SBIR/STTR Transfer	-	0.555	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT5 / *Integrated Tactical Network/Enterprise Network*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	12.225	22.785

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Network CFT will coordinate on technologies to be evaluated with appropriate Program Management offices where there is an opportunity for technology insertion. Technologies that are determined to address technology gaps and require further evaluation will be documented in an acquisition decision memorandum after being approved by the Milestone Decision Authority. The various prototyping programs in this project will be pursued via competitively awarded contracts using best value source selection procedures.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / *Unified Network Transport*	Project (Number/Name) BT5 / *Integrated Tactical Network/Enterprise Network*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		0.861	Mar 2020	-		-		-	0.000	0.861	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.555		-		-		-	0.000	0.555	-
		Subtotal	-	-		1.416		-		-		-	0.000	1.416	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM (Technical Exchange Meeting) Prototyping and Evaluations	TBD	TBD : TBD	-	-		7.087	Jul 2020	-		-		-	0.000	7.087	-
Commercially-driven Prototyping and Evaluation	TBD	TBD : TBD	-	-		-		9.485	Feb 2021	-		9.485	0.000	9.485	-
Government-driven Prototyping and Evaluation	TBD	CCDC C5ISR; PEO C3T : APG, MD	-	-		-		13.300	Dec 2020	-		13.300	0.000	13.300	-
		Subtotal	-	-		7.087		22.785		-		22.785	0.000	29.872	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM Engineering Technical Support	TBD	TBD : TBD	-	-		1.861	Jun 2020	-		-		-	0.000	1.861	-
		Subtotal	-	-		1.861		-		-		-	0.000	1.861	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT5 / *Integrated Tactical Network/Enterprise Network*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	TBD	TBD : TBD	-	-		1.861		-		-		-	0.000	1.861	-
		Subtotal	-	-		1.861		-		-		-	0.000	1.861	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		12.225		22.785		-		22.785	0.000	35.010	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT5 / *Integrated Tactical Network/Enterprise Network*

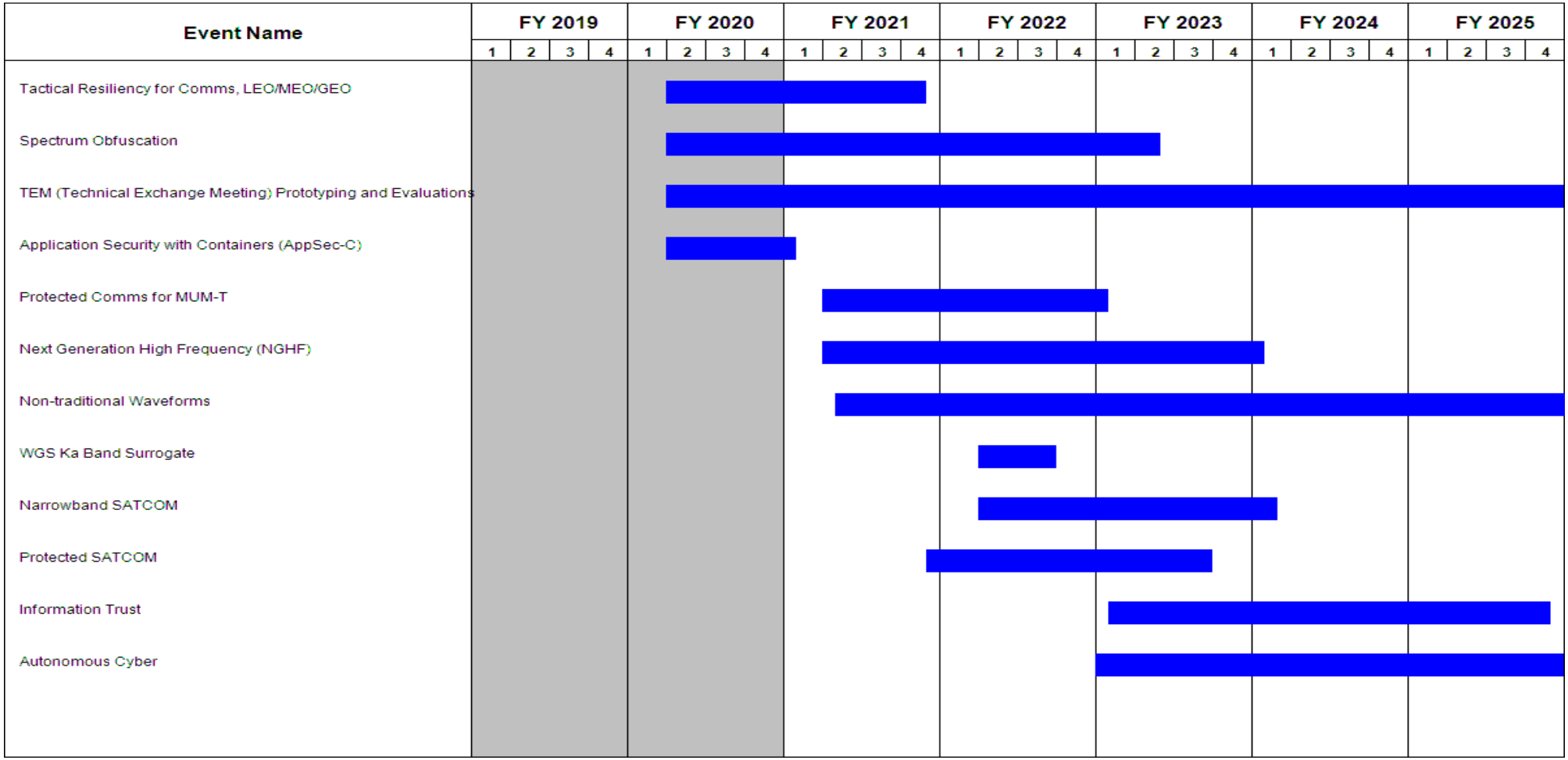

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604541A / *Unified Network Transport*	**Project (Number/Name)** BT5 / *Integrated Tactical Network/Enterprise Network*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Tactical Resiliency for Comms, LEO/MEO/GEO	2	2020	4	2021
Spectrum Obfuscation	2	2020	2	2023
TEM (Technical Exchange Meeting) Prototyping and Evaluations	2	2020	4	2025
Application Security with Containers (AppSec-C)	2	2020	1	2021
Protected Comms for MUM-T	2	2021	1	2023
Next Generation High Frequency (NGHF)	2	2021	1	2024
Non-traditional Waveforms	2	2021	1	2026
WGS Ka Band Surrogate	2	2022	3	2022
Narrowband SATCOM	2	2022	1	2024
Protected SATCOM	4	2021	3	2023
Information Trust	1	2023	4	2025
Autonomous Cyber	1	2023	4	2025

Note

TEM projects are continuous activities; N-CFT will reach out to industry partners in order to assess and demonstrate the latest emerging technologies which will reduce capability gaps and provide rapid software/hardware insertions into Programs of Record.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604644A / *Mobile Medium Range Missile*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
MR1: *Mobile Intermediate Range Missile*	-	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000

Note

Fiscal Year (FY) 2021 funding change is a result of Army realignment of funds to higher priority programs.

A. Mission Description and Budget Item Justification

Mobile Medium Range Missile provides the Joint Force Commander a lower cost strategic capability that can attack specific threat vulnerabilities in order to penetrate, dis-integrate, and exploit in the strategic and deep maneuver areas. It mitigates Extremely High Risk (EHR) capability gap. There is no FY 2021 funding request.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	20.000	90.000	-	90.000
Current President's Budget	0.000	5.000	0.000	-	0.000
Total Adjustments	0.000	-15.000	-90.000	-	-90.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-15.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-90.000	-	-90.000

Change Summary Explanation

FY 2020 and FY 2021 funding change is a result of Army realignment of funds to higher priority programs.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604644A / *Mobile Medium Range Missile*	Project (Number/Name) MR1 / *Mobile Intermediate Range Missile*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
MR1: *Mobile Intermediate Range Missile*	-	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Fiscal Year (FY) 2021 funding change is a result of Army realignment of funds to higher priority programs.

A. Mission Description and Budget Item Justification

Mobile Medium Range Missile provides the Joint Force Commander a lower cost strategic capability that can attack specific threat vulnerabilities in order to penetrate, dis-integrate, and exploit in the strategic and deep maneuver areas. It mitigates Extremely High Risk (EHR) capability gap. There is no FY 2021 funding.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: TM/RR ***Description:*** Develop the Army's next generation medium range strike missile capability. Mobile Medium Range Missile provides field artillery units with an extended range capability supporting strategic forces in full, limited or expeditionary operations. ***FY 2020 Plans:*** Supported acquisition strategy development, system requirements/specification definition/development, transitioned technology/ component maturation assessment, and contract strategy development. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY 2021 funding change is a result of Army realignment of funds to higher priority programs.	-	4.773	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.227	-
Accomplishments/Planned Programs Subtotals	-	5.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604644A / *Mobile Medium Range Missile*	**Project (Number/Name)** MR1 / *Mobile Intermediate Range Missile*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Leverage non-traditional contracting strategy to transition/develop/mature current and near-term support efforts to provide Joint Force Commanders capabilities to attack specific threat vulnerabilities in order to penetrate, dis-integrate, and exploit in the strategic and deep maneuver areas.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604644A / *Mobile Medium Range Missile*	**Project (Number/Name)** MR1 / *Mobile Intermediate Range Missile*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Program Management	TBD	TBD : TBD	-	-		1.430	Oct 2019	-		-		-	0.000	1.430	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.227		-		-		-	0.000	0.227	-
		Subtotal	-	-		1.657		-		-		-	0.000	1.657	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Contract	TBD	TBD : TBD	-	-		3.343	Oct 2019	-		-		-	0.000	3.343	-
		Subtotal	-	-		3.343		-		-		-	0.000	3.343	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		5.000		-		-		-	0.000	5.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604644A / *Mobile Medium Range Missile*	**Project (Number/Name)** MR1 / *Mobile Intermediate Range Missile*

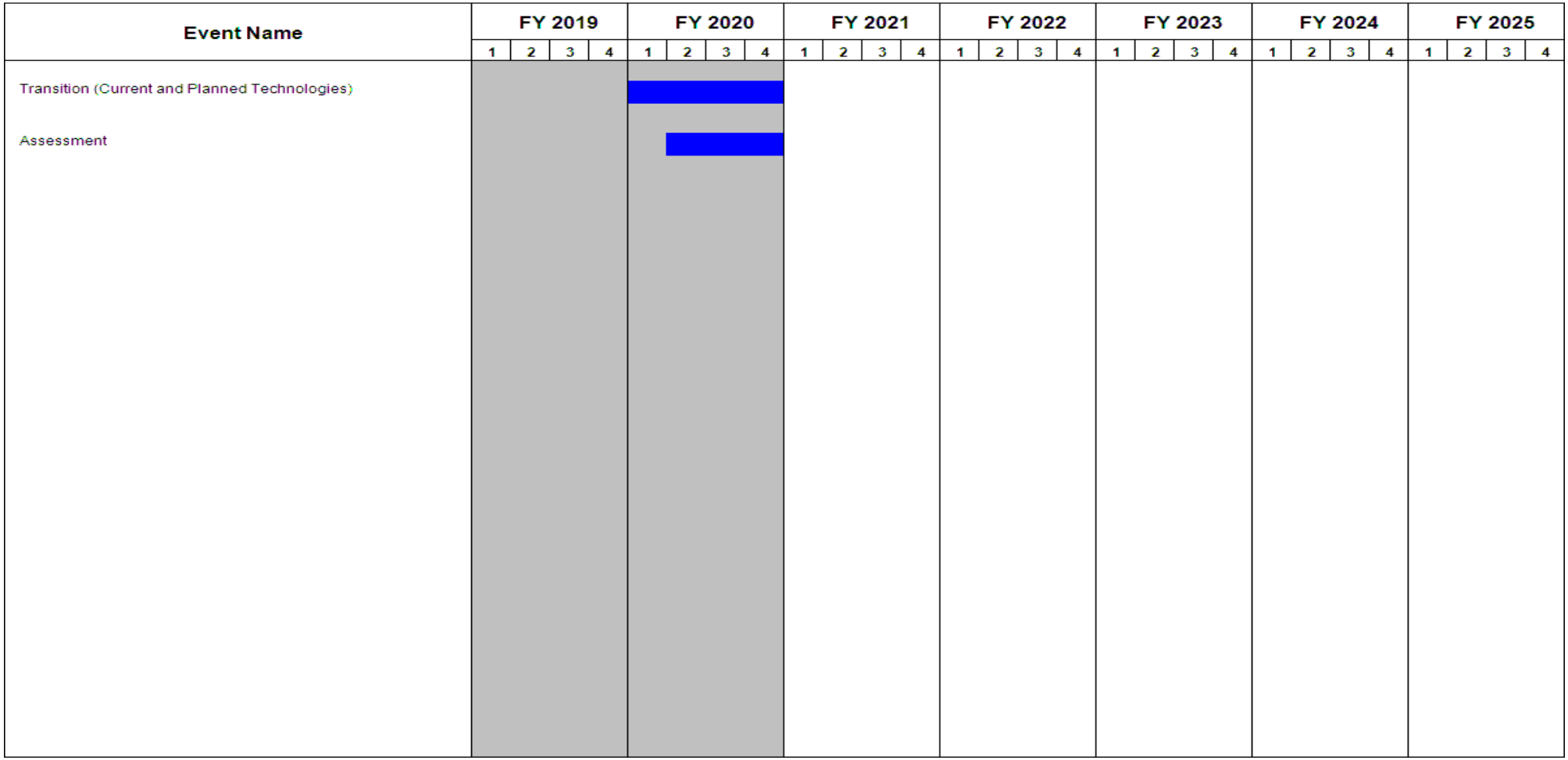

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604644A / *Mobile Medium Range Missile*	**Project (Number/Name)** MR1 / *Mobile Intermediate Range Missile*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Transition (Current and Planned Technologies)	1	2020	4	2020
Assessment	2	2020	4	2020

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604785A *I Integrated Base Defense (Budget Activity 4)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	2.000	0.000	2.020	2.020	0.000	0.000	0.000	0.000	0.000	4.020
DS4: *Integrated Base Defense*	-	0.000	2.000	0.000	2.020	2.020	0.000	0.000	0.000	0.000	0.000	4.020

A. Mission Description and Budget Item Justification

Integrated Base Defense (IBD) provides integration of software and analytical capability to support the integration of systems in the field. IBD employs an enterprise approach to enable IBD capabilities across the operational spectrum by leveraging interoperability efforts in support of the Integrated Unit, Base, and Installation Protection framework focused on system engineering and software development.

Counter Vehicle Borne Improvised Explosive Device (CVBIED) is an integrated suite of systems developed in response to CENTCOM JUONS CC-0540. CVBIED provides an early VBIED detection capability prior to vehicles reaching entry into Forward Operating Bases. Additional sensor systems are being integrated into the current Force Protection infrastructure as part of CVBIED.

Counter Vehicle Borne Improvised Explosive Device (CVBIED) is not a new start, the program was moved from Program Element 0605033A in FY 2018 and 0205402A in FY 2019.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	2.000	2.020	-	2.020
Current President's Budget	0.000	2.000	0.000	2.020	2.020
Total Adjustments	0.000	0.000	-2.020	2.020	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-2.020	2.020	0.000

Change Summary Explanation

Counter Vehicle Borne Improvised Explosive Device (CVBIED) is not a new start, the program was moved from Program Element 0605033A in FY 2018 and 0205402A in FY 2019.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / *Integrated Base Defense (Budget Activity 4)*	Project (Number/Name) DS4 / *Integrated Base Defense*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
DS4: *Integrated Base Defense*	-	0.000	2.000	0.000	2.020	2.020	0.000	0.000	0.000	0.000	0.000	4.020
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Counter Vehicle Borne Improvised Explosive Device (CVBIED) is not a new start, the program was moved from Program Element 0605033A in FY 2018 and 0205402A in FY 2019.

A. Mission Description and Budget Item Justification

Integrated Base Defense (IBD) provides integration of software and analytical capability to support the integration of systems in the field. IBD employs an enterprise approach to enable IBD capabilities across the operational spectrum by leveraging interoperability efforts in support of the Integrated Unit, Base, and Installation Protection framework focused on system engineering and software development.
Counter Vehicle Borne Improvised Explosive Device (CVBIED) is an integrated suite of systems developed in response to CENTCOM JUONS CC-0540. CVBIED provides an early VBIED detection capability prior to vehicles reaching entry into Forward Operating Bases. Additional sensor systems are being integrated into the current Force Protection infrastructure as part of CVBIED.

OCO funding in the amount of $2.020 million supports continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps with JUONS CC-0540.

Counter Vehicle Borne Improvised Explosive Device (CVBIED) is not a new start, the program was moved from Program Element 0605033A in FY 2018 and 0205402A in FY 2019.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: CVBIED Design and Build	-	2.000	0.000	2.020	2.020
Description: Effort continues the design and integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540					
FY 2020 Plans: Funding support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540.					
FY 2021 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604785A / *Integrated Base Defense (Budget Activity 4)*	**Project (Number/Name)** DS4 / *Integrated Base Defense*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
No Base RDTE provided ***FY 2021 OCO Plans:*** Funding will support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps with JUONS CC-0540. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Inflationary increase over previous budget year					
Accomplishments/Planned Programs Subtotals	-	2.000	0.000	2.020	2.020

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• M90115: *INTEG BASE DEF NONSTAND EQUIP (IBD NS-E) KITTING*	39.200	39.984	0.000	64.584	64.584	-	-	-	-	0.000	143.768

Remarks

D. Acquisition Strategy

The IBD acquisition strategy is to leverage existing IBD-related government organizations and to competitively award multiple contracts in support of IBD objectives for the development of holistic IBD architectures and products to support interoperability of fielded and emerging IBD-related systems. JUONS CC-0540 (CVBIED) equipment is comprised of a combination of Commercial and Government Off the Shelf items integrated to meet the requirements of JUONS CC-0540 (CVBIED).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / *Integrated Base Defense (Budget Activity 4)*	Project (Number/Name) DS4 / *Integrated Base Defense*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
JUONS CC-0540 System Integration	MIPR	AMRDEC : Huntsville, AL	-	-		0.379	Jan 2020	0.000		0.400	Jan 2021	0.400	0.000	0.779	-
JUONS CC-0540 Hyper spectral Sensor Development Support	MIPR	RDECOM CERDEC : Fort Belvoir, VA	-	-		0.203	Jan 2020	0.000		0.500	Jan 2021	0.500	0.000	0.703	-
JUONS CC-0540 Wide Area Motion Imagery Sensor Development	MIPR	NAVAIR : Patuxent River, MD	-	-		0.608	Jan 2020	0.000		0.350	Jan 2021	0.350	0.000	0.958	-
Integrated System Architecture (ISA) SW Development Support	MIPR	NVESD : Fort Belvoir	-	-		-		0.000		0.270	Jan 2021	0.270	0.000	0.270	-
		Subtotal	-	-		1.190		0.000		1.520		1.520	0.000	2.710	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	MIPR	ATEC : Aberdeen Proving Ground, MD	-	-		0.810	Jan 2020	0.000		0.500	Oct 2020	0.500	0.000	1.310	-
		Subtotal	-	-		0.810		0.000		0.500		0.500	0.000	1.310	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.000		0.000		2.020		2.020	0.000	4.020	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604785A / *Integrated Base Defense (Budget Activity 4)*	**Project (Number/Name)** DS4 / *Integrated Base Defense*

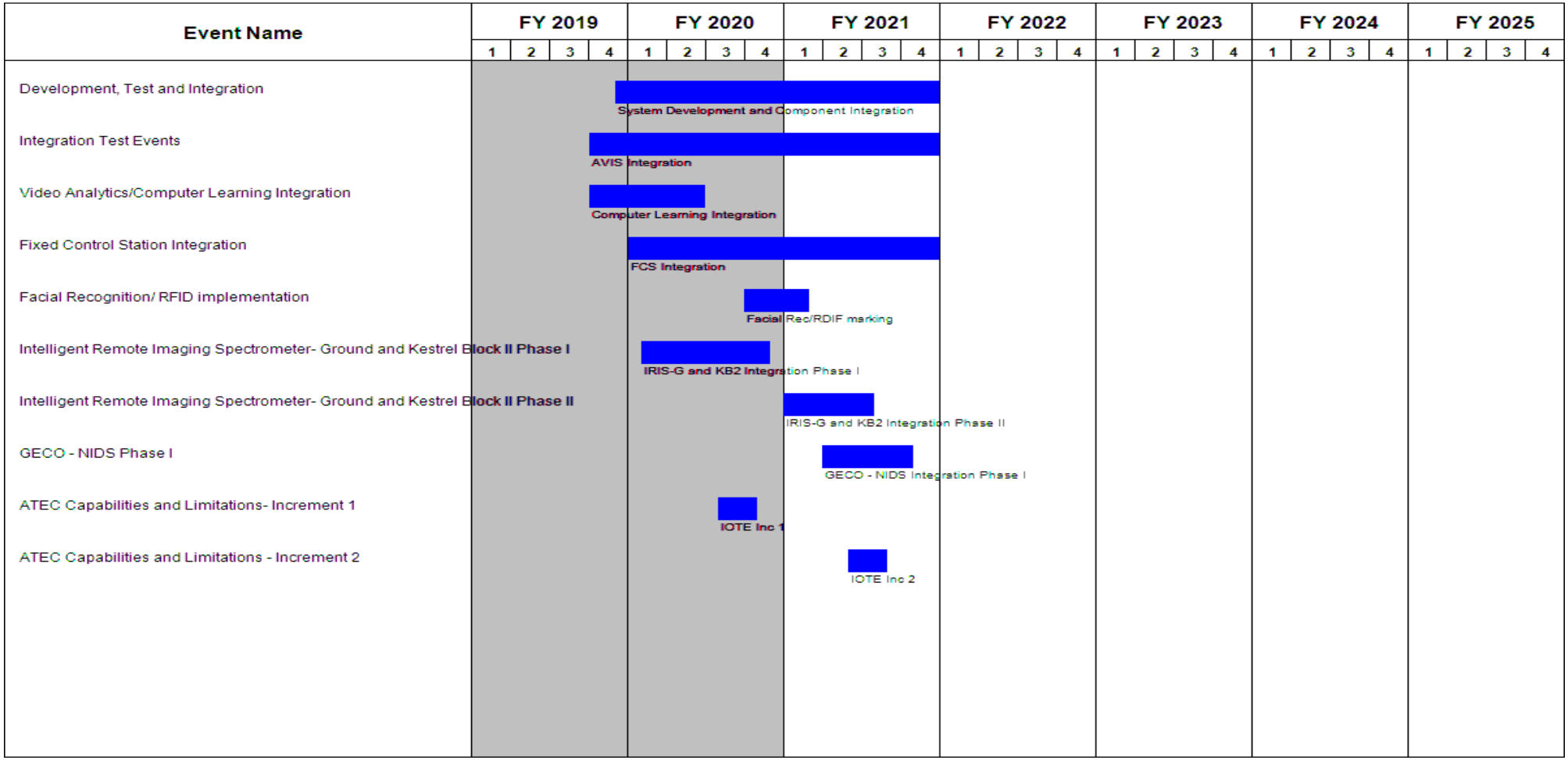

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604785A / *Integrated Base Defense (Budget Activity 4)*	**Project (Number/Name)** DS4 / *Integrated Base Defense*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Development, Test and Integration	4	2019	4	2021
Integration Test Events	4	2019	4	2021
Video Analytics/Computer Learning Integration	4	2019	2	2020
Fixed Control Station Integration	1	2020	4	2021
Facial Recognition/ RFID implementation	4	2020	1	2021
Intelligent Remote Imaging Spectrometer- Ground and Kestrel Block II Phase I	1	2020	4	2020
Intelligent Remote Imaging Spectrometer- Ground and Kestrel Block II Phase II	1	2021	3	2021
GECO - NIDS Phase I	2	2021	4	2021
ATEC Capabilities and Limitations- Increment 1	3	2020	4	2020
ATEC Capabilities and Limitations - Increment 2	2	2021	3	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0305251A / *Cyberspace Operations Forces and Force Support*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	52.817	52.102	50.525	-	50.525	48.644	50.411	49.966	50.529	0.000	354.994
FA8: *Cyberspace Operations Forces and Force Support*	-	52.817	52.102	50.525	-	50.525	48.644	50.411	49.966	50.529	0.000	354.994

A. Mission Description and Budget Item Justification

Persistent Cyber Training Environment (PCTE) supports the United States Cyber Command (USCC) by enabling a critical need for the DoD Cyber Mission Force (CMF) to train at the individual, team, and force level. The service cyber components have established their own training environments, but do not have standardized capabilities or content. PCTE will provide the Department of Defense (DoD) cyber forces with a standardized training capability that utilizes shared content across the Services to include emulated network environments and has the ability to connect to other range environments.. The PCTE platform is aligned to the outputs of the Office of the Under Secretary of Defense for Acquisition & Sustainment OUSD (A&S) and Chairman of the Joint Chiefs of Staff (CJCS) J6 led, "Cyber Range Evaluation of Alternatives (EOA) Findings and Issue Paper Deliberations," dated 17 November 2015. The Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) was designated as the DoD Acquisition Lead for the PCTE and the program is directed by the 2016 National Defense Authorization Act, Section 1645. With the JROC validation of the Information System - Capability Development Document (IS-CDD) on 4 November 2019, the PCTE program quickly achieved Milestone B on 6 December 2019.

FY 2021 will focus on adding capability into the platform releases while updating to support increased automation, scalability, and usability. Planned updates include an Intel capability, enhanced After Action Review (AAR), and Platform Enterprise services to increase realism of the training environment. The planned updates also include automation to refine the build out of PCTE which decreases manual processes. The PCTE platform will obtain accreditation at the Top Secret (TS) level to serve the critical need of DoD Cyber Mission Force (CMF) users to train at the TS data classification level. Platform licensing will be scaled to support the full DoD CMF user base which has resulted in a shift in funding.

B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	52.817	52.102	53.578	-	53.578
Current President's Budget	52.817	52.102	50.525	-	50.525
Total Adjustments	0.000	0.000	-3.053	-	-3.053
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-3.053	-	-3.053

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0305251A *I Cyberspace Operations Forces and Force Support*

Change Summary Explanation

FY 2021 reduced to fund higher Army priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / *Cyberspace Operations Forces and Force Support*	Project (Number/Name) FA8 / *Cyberspace Operations Forces and Force Support*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FA8: *Cyberspace Operations Forces and Force Support*	-	52.817	52.102	50.525	-	50.525	48.644	50.411	49.966	50.529	0.000	354.994
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Persistent Cyber Training Environment (PCTE) supports the United States Cyber Command (USCC) by enabling a critical need for the DoD Cyber Mission Force (CMF) to train at the individual, team, and force level. The service cyber components have established their own training environments, but do not have standardized capabilities or content. PCTE will provide the Department of Defense (DoD) cyber forces with a standardized training capability that utilizes shared content across the Services to include emulated network environments and has the ability to connect to other range environments. The PCTE platform is aligned to the outputs of the Office of the Under Secretary of Defense for Acquisition & Sustainment OUSD (A&S) and Chairman of the Joint Chiefs of Staff (CJCS) J6 led, "Cyber Range Evaluation of Alternatives (EOA) Findings and Issue Paper Deliberations," dated 17 November 2015. The Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) was designated as the DoD Acquisition Lead for the PCTE and the program is directed by the 2016 National Defense Authorization Act, Section 1645. With the JROC validation of the Information System - Capability Development Document (IS-CDD) on 4 November 2019, the PCTE program quickly achieved Milestone B on 6 December 2019.

FY 2021 will focus on adding capability into the platform releases while updating to support increased automation, scalability, and usability. Planned updates include an Intel capability, enhanced After Action Review (AAR), and Platform Enterprise services to increase realism of the training environment. The planned updates also include automation to refine the build out of PCTE which decreases manual processes. The PCTE platform will obtain accreditation at the Top Secret (TS) level to serve the critical need of DoD Cyber Mission Force (CMF) users to train at the TS data classification level. Platform licensing will be scaled to support the full DoD CMF user base which has resulted in a shift in funding.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Event Management for Persistent Cyber Training Environment (PCTE)	23.400	25.600	37.897
Description: Develop event scheduling, allocation, and management function for PCTE, to include event design, planning and execution, supported by standardized training assessment tools and capabilities.			
FY 2020 Plans: The expansion of the fielded PCTE capabilities will include the ability to have an automated opposition force that is reactive to the trainee and the capability of using near real-time intelligence to update training scenarios, Tactics, Techniques, and Procedures (TTPs). Will also provide the material solution to support the Technical Operations Management (TOM) capability.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0305251A / *Cyberspace Operations Forces and Force Support*	**Project (Number/Name)** FA8 / *Cyberspace Operations Forces and Force Support*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
PCTE capabilities will be scaled to support the full DoD Cyber Mission Force (CMF) user base. New capabilities, as prioritized by the United States Cyber Command (USCC) and CMF feedback, will include enhanced After Action Review (AAR), Intel capabilities and improved Opposing Force Campaigns. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding was increased to support the full DoD Cyber Mission Force user base.			
Title: Environment Operations and Management for Persistent Cyber Training Environment (PCTE) ***Description:*** Develop PCTE with realistic vignettes/scenarios as part of a system (syllabus) of individual and collective training that includes certification and real-world mission rehearsals. ***FY 2020 Plans:*** Will continue to build and host persistent virtual environments that DoD Cyber Mission Forces use as their training maneuver terrain. These high fidelity virtual environments allow realistic and relevant training on demand that are representative of actual network or system environments. FY 2020 also continues to add more blue environments, red environments, Industrial Control System (ICS), and Supervisory Control and Data Acquisitions (SCADA) virtualizations to support multiple simultaneous training events. Additional environments will be created based on priority per the validated Initial Capability Document (ICD) that include telepresence, battlefield systems (blue and red), and commercial mobile. ***FY 2021 Plans:*** PCTE virtual environments will be maintained, with limited expansion due to the increase in platform capabilities to support the full DoD Cyber Mission Force (CMF) user base. PCTE will continue to integrate virtual environments training resources which will include minor enhancements prioritized by user feedback. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding was reprioritized to support the increased scale of PCTE Event Management capabilities to support the full DoD Cyber Mission Force user base.	13.400	13.400	4.244
Title: Physical and Virtual Connectivity for the Persistent Cyber Training Environment (PCTE) ***Description:*** PCTE has procured, installed and is maintaining Regional Compute and Storage (RCS) nodes which enable on-demand, reliable, and secure virtual access from wherever participants are geographically located. Additionally, the PCTE RCS infrastructure create a core cyber exercise network and event management platform to support Cyber Mission Force (CMF) training at the Unclassified, Secret, and Top Secret data classification levels. ***FY 2020 Plans:***	10.500	10.600	6.592

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0305251A / *Cyberspace Operations Forces and Force Support*	**Project (Number/Name)** FA8 / *Cyberspace Operations Forces and Force Support*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Connectivity will continue to extend the PCTE capabilities to more regional or base training facilities. This also includes extending the PCTE services to the National Guard and Reserve Cyber Mission Forces (CMF) teams, expansion to Government or commercial cloud capabilities, and expansion onto DoD enterprise transport capabilities to improve the reach of selected PCTE services. ***FY 2021 Plans:*** Will maintain the current build out of the PCTE Regional Compute and Storage (RCS) nodes while leveraging DoD enterprise transport services spanning multiple classification levels (Top Secret to Unclassified) to perform training. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding was reprioritized to support the increased scale of PCTE Event Management capabilities to support the full DoD Cyber Mission Force user base.			
Title: Persistent Cyber Training Environment (PCTE) Test and Evaluation ***Description:*** Persistent Cyber Training Environment (PCTE) integration, development, and operational testing that will include validation and verifications (V&V), limited user assessments (LUA), and testing in association with cyber training exercises and incorporated throughout the Product Manager (PM) Development Operations (DevOps) process. An Operational Test Authority (OTA) has been incorporated, in coordination with the Director, Operational Test and Evaluation (DOT&E), to conduct operational testing leveraging DevOps testing processes. ***FY 2020 Plans:*** Testing will continue in FY 2020 through integration testing, validation and verifications, limited user assessments, and exercises serving as PCTE operational testing. Testing is essential in FY 2020 to ensure that any fielded capability drop does not break the existing PCTE platform and training capabilities. Testing will also focus more on the ability to conduct multiple training events and the team/group and force levels. ***FY 2021 Plans:*** Testing will continue in FY 2021 with integration, verification and validation testing of the PCTE capability. The focus for FY 2021 is on verifying the modification of existing capability and the successful integration of new capability through developmental testing and operational assessments. PCTE will be transitioning from DevOps into a more formal Development Security Operations (DevSecOps) process, ensuring security testing is incorporated at the lowest level to enable reliability and responsiveness. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding was reprioritized to support the increased scale of PCTE Event Management capabilities to support the full DoD Cyber Mission Force user base.	5.517	2.502	1.792
Accomplishments/Planned Programs Subtotals	52.817	52.102	50.525

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• B65010: *Persistent Cyber Training Environment*	3.000	3.000	0.000	-	0.000	-	-	-	-	0.000	6.000

Remarks

B65010-OPA2 -
Beginning FY 2021, OPA funds reprogrammed to Operations and Maintenance Army (OMA) (APE 151251000, MDEP VLWA) for software licensing for cyber training applications. PCTE has procured and installed the appropriate hardware infrastructure footprint to enable the platform to serve the Cyber Mission Force user base.

D. Acquisition Strategy

The Persistent Cyber Training Environment (PCTE) program will employ an incremental acquisition strategy. The current strategy leverages the use of existing cyber contracts and Other Transaction Authority (OTA) vehicles to provide specified capabilities that will be integrated into a cohesive training platform. The next step in the acquisition strategy is developing a long term contract vehicle that will continue enabling the PCTE platform to achieve scalability, optimization, innovation, and quality standards to meet the dynamic needs of the Cyber Mission Force (CMF) user base. The PM is in the process of awarding a Single Award Indefinite Delivery/Indefinite Quantity (ID/IQ) contract to serve PCTE as well as other cyber community customers called the Cyber Training, Readiness, Integration, Delivery, and Enterprise Technology (TRIDENT) contract in Q2FY2021. CYBER TRIDENT enables PCTE to provide iterative capability provided to the Cyber Mission Forces (CMF) in Capability Drops (CDs) that either improve or add features. These CDs will be based on requirements contained and further developed as part of the PCTE Information System - Capability Development Document (IS-CDD).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Program Management	TBD	Various : Various	2.300	-		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	2.300	-		-		-		-		-	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PCTE Development and Integration	C/IDIQ	Various : Various	81.424	47.388	Feb 2019	49.602	Feb 2020	1.636	Feb 2021	-		1.636	Continuing	Continuing	Continuing
PCTE Cyber Training, Readiness, Integration, Delivery, and Enterprise Technology (TRIDENT)	C/IDIQ	Various : Various	-	-		-		16.000	Feb 2021	-		16.000	Continuing	Continuing	Continuing
PCTE Development and Integration - Other Transactional Authority	Option/ FFP	Various : Various	-	-		-		31.097	Oct 2020	-		31.097	Continuing	Continuing	Continuing
		Subtotal	81.424	47.388		49.602		48.733		-		48.733	Continuing	Continuing	N/A

Remarks

PCTE will utilize existing contracts in order to provide the best capabilities available within the market until the base contract is awarded in FY2020.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PCTE Government Test and Evaluation	Various	Various : Various	1.683	5.429	Mar 2019	2.500	Mar 2020	1.792	Mar 2021	-		1.792	Continuing	Continuing	Continuing
		Subtotal	1.683	5.429		2.500		1.792		-		1.792	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / *Cyberspace Operations Forces and Force Support*	Project (Number/Name) FA8 / *Cyberspace Operations Forces and Force Support*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks Validation and Verification tests will be conducted with every capability drop utilizing Cyber Mission Force operators and representatives from the Operational Test Authority. PCTE will host limited excursions during cyber exercises in order to provide an operational evaluation ultimately building up to hosting a major force level exercise event.															

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	85.407	52.817		52.102		50.525		-		50.525	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0305251A / *Cyberspace Operations Forces and Force Support*	**Project (Number/Name)** FA8 / *Cyberspace Operations Forces and Force Support*

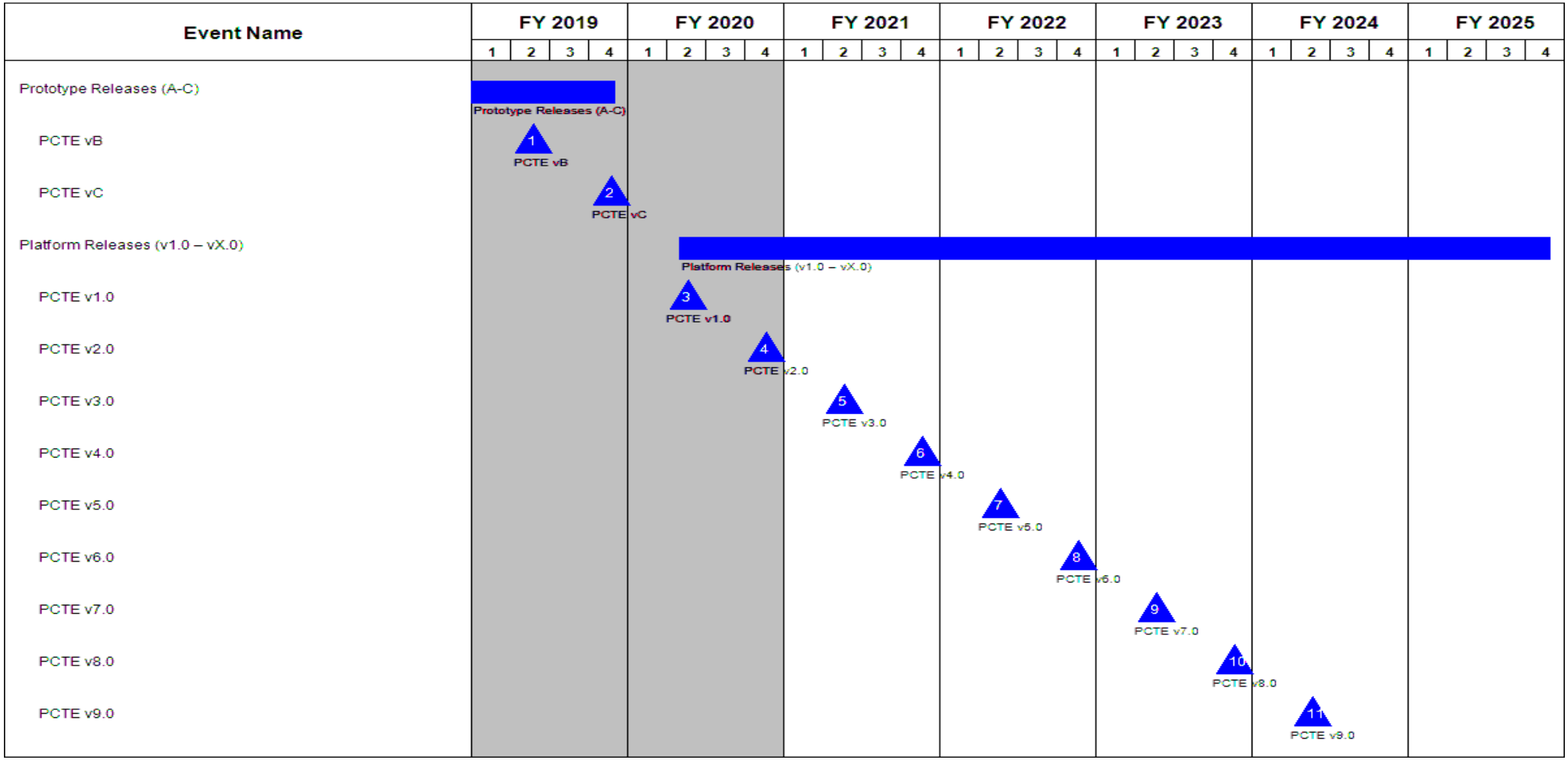


Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0305251A / *Cyberspace Operations Forces and Force Support*	**Project (Number/Name)** FA8 / *Cyberspace Operations Forces and Force Support*

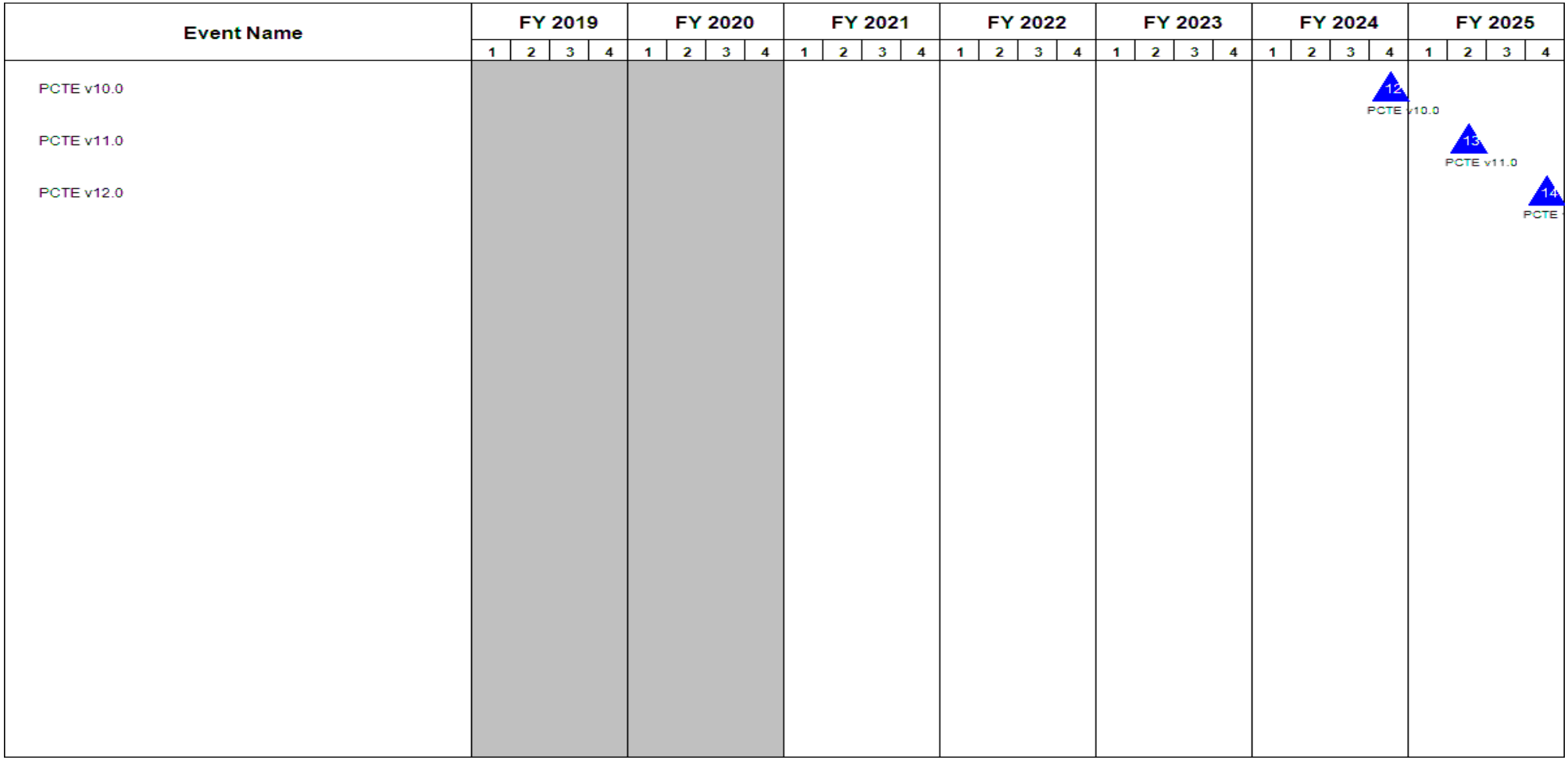


Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0305251A / *Cyberspace Operations Forces and Force Support*	**Project (Number/Name)** FA8 / *Cyberspace Operations Forces and Force Support*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Prototype Releases (A-C)	4	2018	4	2019
PCTE vA	4	2018	4	2018
PCTE vB	2	2019	2	2019
PCTE vC	4	2019	4	2019
Platform Releases (v1.0 ? vX.0)	2	2020	4	2025
PCTE v1.0	2	2020	2	2020
PCTE v2.0	4	2020	4	2020
PCTE v3.0	2	2021	2	2021
PCTE v4.0	4	2021	4	2021
PCTE v5.0	2	2022	2	2022
PCTE v6.0	4	2022	4	2022
PCTE v7.0	2	2023	2	2023
PCTE v8.0	4	2023	4	2023
PCTE v9.0	2	2024	2	2024
PCTE v10.0	4	2024	4	2024
PCTE v11.0	2	2025	2	2025
PCTE v12.0	4	2025	4	2025

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206120A *I Assured Positioning, Navigation and Timing (PNT)*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	123.364	139.110	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	262.474
FJ8: *Assured Positioning, Navigation and Timing (PNT)*	-	62.628	42.379	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	105.007
FJ9: *Dismounted A-PNT*	-	15.384	28.758	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	44.142
FK1: *Pseudolites*	-	0.953	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.953
FK2: *Mounted A-PNT*	-	35.775	59.073	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	94.848
FK3: *Anti-Jam Antenna*	-	8.624	8.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.524

Note

Program Element (PE) 1206120A transitions to PE 0604120A beginning in FY21.

A. Mission Description and Budget Item Justification

Assured Positioning, Navigation and Timing (A-PNT) provides Army ground maneuver forces access to assured PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied (jammed and spoofed). A-PNT products are ruggedized tactical systems that enable Army forces at echelon the ability to shoot, move, communicate, and protect their forces to penetrate and dis-integrate enemy anti-access systems, thereby allowing them to maneuver from operational and strategic distances to close with, destroy, and exploit the enemy in close and deep maneuver areas with sufficient combat bower, tempo, and momentum. A-PNT addresses two critical capability gaps: Access and Integrity. Access is the ability to retrieve accurate PNT information in a contested Electronic Warfare/Cyber environment. Integrity is the ability to trust the PNT information. PNT is a critical enabler of many Army Maneuver, Fires, and Command and Control systems that are dependent on accurate Position and Timing, and a foundational Multi-Domain Battle capability to support: calibrated force posture (position and maneuver across strategic distances); multi-domain formations (operate in contested spaces against near-peer adversaries); convergence (continuous integration of capabilities in all domains). The current Global Positioning System (GPS) capability is a fixed frequency system susceptible to electronic warfare and field environments (e.g. urban, dense vegetation).

Joint Requirements Oversight Council Memo (JROCM) 049-10, dated 05 April 2010, approved the PNT Assurance Initial Capabilities Document and designated the Army as the Lead Component for Assured PNT. Army Futures Command approved the Mounted A-PNT System (MAPS) Directed Requirement (DR) on 13 January 2019. The Dismounted A-PNT System (DAPS) Directed Requirement was approved 05 April 2019. The Alternative Navigation (ALTNAV) Directed Requirement was approved in November 2019. MAPS transitions to a Capability Development Document (CDD) in June 2020 and DAPS transitions in FY 2021.

Assured Positioning, Navigation and Timing (A-PNT) consists of:
(FJ8) - The Assured PNT project funding line is for: PNT System of Systems Architecture (SOSA) Testing to validate performance of end-to-end system performance; Resiliency and Software Assurance Measures (RSAM) upgrades to legacy GPS systems. In addition, this line supports the development of complementary and

adjacent A-PNT technologies as well as Enterprise Enablers including the Alternative Navigation (ALT NAV) signal Enterprise Build-out. These technologies will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT.

(FJ9) - Dismounted Assured PNT (A-PNT) System (DAPS) will provide the Soldiers equipped with Nett Warrior and other Soldier architecture compliant systems (e.g.Integrated Visual Augmentation System (IVAS)) conducting operations outside of vehicles, unhindered access the critical timing and position data to effectively engage targets, share data across the network and conduct mission command functions.

(FK1) - The Pseudolite project was terminated by the Army on 12 February 2019.

(FK2) - The Mounted Assured Positioning, Navigation, and Timing (PNT) System (MAPS) is a platform-mounted, ruggedized tactical PNT system which provides electronic protection capabilities that enable combatant commanders the ability to move, shoot, and communicate in a Global Positioning System (GPS) challenged or denied environments.

(FK3) - The Anti-Jam Antenna Systems (AJAS) provides GPS signal point protection and PNT Assurance in challenged environments through Anti-Jam technologies. AJAS enables tactical capabilities through assured signal acquisition in challenged environments. The AJAS will assist in delivering distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	128.640	192.562	221.875	-	221.875
Current President's Budget	123.364	139.110	0.000	-	0.000
Total Adjustments	-5.276	-53.452	-221.875	-	-221.875
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-53.452			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-5.276	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-221.875	-	-221.875

Change Summary Explanation

Program Element (PE) 1206120A transitions to PE 0604120A beginning in FY21.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ8 / *Assured Positioning, Navigation and Timing (PNT)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FJ8: *Assured Positioning, Navigation and Timing (PNT)*	-	62.628	42.379	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	105.007
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Element (PE) 1206120A project FJ8, planned program title Assured Positioning, Navigation and Timing Enterprise Enablers transitions to PE 0604120A project BV4 beginning in FY21.

Program Element (PE) 1206120A project FJ8, planned program title PNT System of System (SOSA) Testing and Resiliency and Software Assurance Measures (RSAM) transitions to PE 0604120A project ED5 beginning in FY21.

A. Mission Description and Budget Item Justification

The Assured Positioning, Navigation and Timing (PNT) project funds the Resiliency and Software Assurance Measures (RSAM) which provides increased capability and situational awareness for 500,000+ fielded legacy military Global Positioning System (GPS) receivers supporting systems and soldiers through at least 2035. Legacy GPS receivers targeted for RSAM enhancements, include but are not limited to, 226,000 Defense Advanced GPS Receiver (DAGR) and 200,000+ embedded Ground Based-GPS Receiver Applications Module (GB-GRAM). RSAM mitigates risks in a GPS-challenged operational environment until future Positioning, Navigation and Timing (PNT) solutions are fully deployed. This line also funds the Assured PNT enablers which includes prototype development and testing to demonstrate and prove emerging capabilities for legacy and future PNT resilient solutions. Assured PNT enablers also includes the Alternative Navigation signal enterprise build-out, providing PNT data in a denied or degraded environment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: PNT System of System (SOSA) Testing and Resiliency and Software Assurance Measures (RSAM)	31.642	21.030	-	-	-
Description: The effort supports SOSA testing, RSAM and other Army PNT capabilities. ***FY 2020 Plans:*** FY 2020 base funds support continued Update 2 software development against emerging threats for Defense Advanced GPS Receiver (DAGR) and Ground Based GPS Receiver Application Module (GB-GRAM/ MicroGRAM). PNT Systems of Systems (SOSA) testing and Resiliency and Software Assurance Measures (RSAM) will complete software development Update 1 for GB-GRAM and continue software development for MicroGRAM, to include engineering build testing, formal qualification testing, and risk mitigation efforts for platforms utilizing					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Defense Advanced GPS Receiver (DAGR) and GB-GRAM. In addition, DAGR RSAM and GB-GRAM RSAM integration testing efforts will be performed in association with relevant platforms. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** RDT&E funding decreased from $21.992 million in FY 2020 to $0.0 million in FY 2021 due to transitioning to PE 0604120A project ED5.					
Title: Assured Positioning, Navigation and Timing (PNT) Enterprise Enablers and Build-out ***Description:*** Enterprise Enablers provide enhanced PNT capability across an operational enterprise. These materiel solutions may augment or replace GPS by providing complementary PNT information. As complementary PNT providers, Enterprise Enablers build resiliency and robustness by diversifying PNT sources to ensure Soldiers have the right PNT information to drive mission success. ***FY 2020 Plans:*** FY 2020 Base funds will continue through market research, prototyping, experimentation, and technical demonstrations of ALT NAV, emerging situational awareness capabilities and net-enabled GPS solutions. These solutions will leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process, that will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT. Other efforts include the continuation of Situational Awareness development, spectrum modification for PNT solutions (Alternative PNT Banding) and modeling and simulation support for Radio Frequency (RF) signals of opportunity for PNT. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** RDT&E funding decreased from $20.387 million in FY 2020 to $0.0 million in FY 2021 due to transitioning to PE 0604120A project BV4.	27.955	19.425	-	-	-
Title: FY 2018 NDAA SEC 825 ***Description:*** FY 2018 NDAA SEC 825	0.118	-	-	-	-
Title: FY 2019 Rescission	2.913	-	-	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	1.924	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funding transferred in accordance with Title 15 USC ?638					
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	62.628	42.379	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49010: *Mounted/ Dismounted Receivers*	-	1.724	5.894	-	5.894	7.193	7.075	2.370	2.394	Continuing	Continuing

Remarks

K49010: Mounted/Dismounted Receivers is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

The planned acquisition strategy for Positioning, Navigation and Timing (PNT) System of Systems Architecture (SOSA) testing and Resiliency and Software Assurance Measures (RSAM) implementation is to award sole source contracts to the original equipment manufacturers and leverage the Communications Electronics Research Development Engineering Center (CERDEC) to develop and evaluate solutions to enhance the resiliency of Global Positioning System (GPS)-dependent systems operating in evolving contested environments. PNT SOSA testing and RSAM implementation will complete software development for Defense Advanced GPS Receiver (DAGR), Ground Based GPS Receiver Applications Module (GB-GRAM), and MicroGRAM to include engineering build testing and formal qualification testing, as well as integration and integration testing, for platforms utilizing DAGR, GB-GRAM and MicroGRAM engineering builds.

The Assured PNT Enterprise Enablers project will conduct market research, prototyping, experimentation, and technical demonstrations of Alternative Navigation (ALT NAV), emerging situational awareness capabilities and net-enabled GPS solutions. These solutions will leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process, that will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT.

The Assured PNT Enterprise Build-out will conduct network integration, installation and testing of the assured timing/location modular enterprise capability for ALT NAV. ALT NAV provides positioning, navigation and timing data in a denied or degraded environment. Enterprise Buildout will be completed to enable ALT NAV capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support	Allot	PM PNT : Various	-	3.056	Jan 2019	2.314	Jan 2020	-		-		-	0.000	5.370	-
FY 2018 NDAA SEC 825 MDAP Cost Overrun	TBD	TBD : TBD	-	0.118		-		-		-		-	0.000	0.118	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.924		-		-		-	0.000	1.924	-
		Subtotal	-	3.174		4.238		-		-		-	0.000	7.412	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RSAM - DAGR Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	-	2.102	Apr 2019	4.709	Dec 2019	-		-		-	0.000	6.811	-
RSAM - GB-GRAM Software Development	SS/CPIF	Rockwell Collins : Cedar Rapids, IA	-	0.272	Sep 2019	2.084	Feb 2020	-		-		-	0.000	2.356	-
Assured PNT Enterprise Enablers	C/FFP	Various : Various	-	-		20.194	Dec 2019	-		-		-	0.000	20.194	-
Assured PNT Enterprise Buildout	MIPR	Various : Various	-	27.955	May 2019	-		-		-		-	0.000	27.955	-
Army Modernization Priorities	MIPR	Rockwell Collins : Cedar Rapids, IA	-	2.034	Mar 2019	-		-		-		-	0.000	2.034	-
FY 2019 Pending Rescission	TBD	TBD : TBD	-	2.913	May 2019	-		-		-		-	0.000	2.913	-
		Subtotal	-	35.276		26.987		-		-		-	0.000	62.263	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ8 / *Assured Positioning, Navigation and Timing (PNT)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Contracting Services	C/FFP	DCS Corp : APG, MD	-	9.110	Jan 2019	2.785	Jan 2020	-		-		-	0.000	11.895	-
Engineering and Technical Government Services	MIPR	C4ISR : Various	-	6.833	Jan 2019	0.033	Jan 2020	-		-		-	0.000	6.866	-
Assured PNT Enterprise Enablers Contractor Engineering Support	Various	DCS Corporation : APG, MD	-	0.328	Jan 2019	-		-		-		-	0.000	0.328	-
		Subtotal	-	16.271		2.818		-		-		-	0.000	19.089	N/A

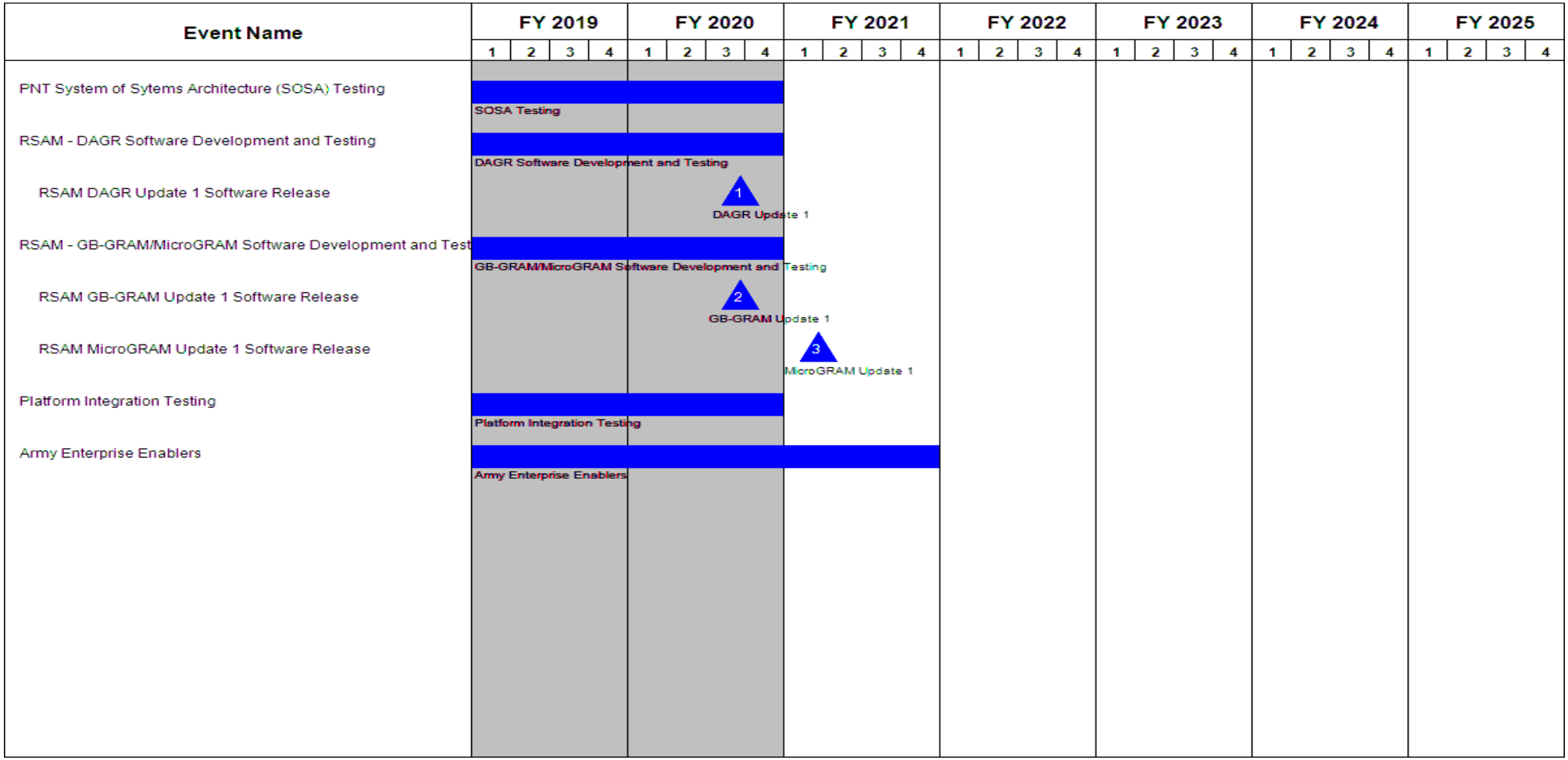
Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SOSA Testing/RSAM - Government Eng Support	MIPR	Various : Various	-	0.826	Jan 2019	2.477	Jan 2020	-		-		-	0.000	3.303	-
SOSA Testing/RSAM - Contractor Eng Support	C/CPFF	Various : Various	-	1.276	Jan 2019	1.672	Jan 2020	-		-		-	0.000	2.948	-
Platform Integration Testing	C/Various	Various : Various	-	3.700	Mar 2019	4.086	Mar 2020	-		-		-	0.000	7.786	-
SOSA Testing/RSAM Test Equipment	C/Various	Various : Various	-	0.191	Apr 2019	0.101	Jun 2020	-		-		-	0.000	0.292	-
Assured PNT Enterprise Buildout Test Support	C/Various	Various : Various	-	1.914	Aug 2019	-		-		-		-	0.000	1.914	-
		Subtotal	-	7.907		8.336		-		-		-	0.000	16.243	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	62.628		42.379		-		-		-	0.000	105.007	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*



Note

Program Element (PE) 1206120A project FJ8, planned program title Assured Positioning, Navigation and Timing Enterprise Enablers transitions to PE 0604120A project BV4 beginning in FY21.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

Program Element (PE) 1206120A project FJ8, planned program title PNT System of System (SOSA) Testing and Resiliency and Software Assurance Measures (RSAM) transitions to PE 0604120A project ED5 beginning in FY21.

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
PNT System of Sytems Architecture (SOSA) Testing	1	2019	4	2020
RSAM - DAGR Software Development and Testing	1	2019	4	2020
RSAM DAGR Update 1 Software Release	3	2020	3	2020
RSAM - GB-GRAM/MicroGRAM Software Development and Testing	1	2019	4	2020
RSAM GB-GRAM Update 1 Software Release	3	2020	3	2020
RSAM MicroGRAM Update 1 Software Release	1	2021	1	2021
Platform Integration Testing	1	2019	4	2020
Army Enterprise Enablers	1	2019	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FJ9: *Dismounted A-PNT*	-	15.384	28.758	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	44.142
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Element (PE) 1206120A project FJ9 transitions to PE 0604120A project EH8 beginning in FY 2021.

A. Mission Description and Budget Item Justification

Dismounted Assured PNT (A-PNT) System (DAPS) implements congressional and OSD guidance to develop and field Military Code (M-Code) Ground User Equipment (MGUE) receivers and provides the Soldiers equipped with Nett Warrior (NW) and other Soldier architecture compliant systems (e.g. Integrated Visual Augmentation System (IVAS)) the critical timing and position data to effectively engage targets, share data across the network, and conduct mission command functions. DAPS is planned to be a size, weight and power (SWaP) optimized form-factor that paces the threats and includes development and integration of Global Positioning System (GPS) and non-GPS sensors. DAPS integrates with the NW system and other Soldier architecture compliant systems, and distributes PNT information to the End-User Device (EUD). DAPS includes receiver software capable of fusing sensors and Global Navigation Satellite Systems (GNSS) signals resulting in additional integrity for military GPS in denied environments and includes a M-Code receiver solution, or a Selective Availability Anti-Spoofing Module (SAASM) system with growth path to M-Code.

Through an iterative approach, DAPS will continue to fuse M-Code, GNSS, and non-GPS sensors, as well as fuse Alternate Navigation (ALTNAV) and other complementary PNT sources in a SWaP constrained system in order to pace/overmatch the threat and continue to deliver critical timing and position data to effectively engage targets, share data across the network, and conduct mission command functions.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Dismounted A-PNT System (DAPS)	15.384	27.452	-	-	-
Description: This effort supports the development and delivery of DAPS prototypes for integration, evaluation and performance testing.					
FY 2020 Plans: FY 2020 Base funds will deliver Dismounted A-PNT prototypes, conduct laboratory, performance and reliability tests. Safety Release and New Equipment Training will be completed. Nett Warrior Hardware and Software integration will be completed followed by final testing in FY 2021. Other efforts include: requirement/design trade					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
studies and early prototyping for user demonstrations of a stand-alone Handheld variant. Integration of IVAS and HUD 3.0 architecture efforts will continue. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** RDT&E funding decreased from $32.360 million in FY 2020 to $0.0 million in FY 2021 due to transitions to PE 0604120A project EH8.					
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.306	-	-	-
Accomplishments/Planned Programs Subtotals	15.384	28.758	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49020: *Dismounted Hub*	-	-	48.449	-	48.449	49.570	26.458	6.063	3.960	Continuing	Continuing

Remarks

K49020 / Dismounted Hub is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

Dismounted A-PNT program will provide the Soldier conducting operations outside of vehicles the means to maintain accurate position, velocity, and time information in Global Positioning System (GPS) challenged or degraded/denied environments where space based PNT may be limited or denied. The Dismounted A-PNT capability will provide improved performance over the currently fielded Defense Advanced GPS Receiver.

The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing Other Transaction Authority (OTA)'s to competitively obtain prototypes. The Government will conduct laboratory and performance testing. The findings from these efforts will provide technology viability and allow for the transition to limited production. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	C/CPFF	Various : Various	-	1.435	Dec 2018	1.399	Dec 2019	-		-		-	0.000	2.834	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.306		-		-		-	0.000	1.306	-
		Subtotal	-	1.435		2.705		-		-		-	0.000	4.140	N/A

Remarks

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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted A-PNT Prototyping & Development Vendor 1	C/FFP	Integrated Solutions for Systems, Inc. (IS4S) : Auburn, AL	-	6.112	Feb 2019	2.196	Nov 2019	-		-		-	0.000	8.308	-
Dismounted A-PNT Prototyping & Development Vendor 2	C/FFP	Mayflower Communications Company, Inc : Bedford, MA	-	2.206	Feb 2019	1.193	Nov 2019	-		-		-	0.000	3.399	-
Dismounted A-PNT Protoyping & Delivery	C/FFP	TBD : TBD	-	-		6.928	Feb 2020	-		-		-	0.000	6.928	-
Development of a Dismounted M-Code capable prototype	MIPR	L3 Technologies Interstate Electronics Corporation : Anaheim, CA	-	1.300	Jun 2019	0.727	Feb 2020	-		-		-	0.000	2.027	-
Development of a small SWAP-C multi sensor navigation prototype	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	0.896	Nov 2018	-		-		-		-	0.000	0.896	-
Engineering and Technical Product Development	MIPR	C5ISR : Various	-	1.060	Dec 2018	3.247	Dec 2019	-		-		-	0.000	4.307	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Nett Warrior Integration	MIPR	Various : Various	-	0.783	Jul 2019	1.567	Feb 2020	-		-		-	0.000	2.350	-
		Subtotal	-	12.357		15.858		-		-		-	0.000	28.215	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	Various	C5ISR : Various	-	0.372	Nov 2018	0.725	Nov 2019	-		-		-	0.000	1.097	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	1.120	Jan 2019	0.793	Nov 2019	-		-		-	0.000	1.913	-
		Subtotal	-	1.492		1.518		-		-		-	0.000	3.010	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Support	C/Various	Various : Various	-	0.100	Dec 2018	8.677	Dec 2019	-		-		-	0.000	8.777	-
		Subtotal	-	0.100		8.677		-		-		-	0.000	8.777	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	15.384		28.758		-		-		-	0.000	44.142	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

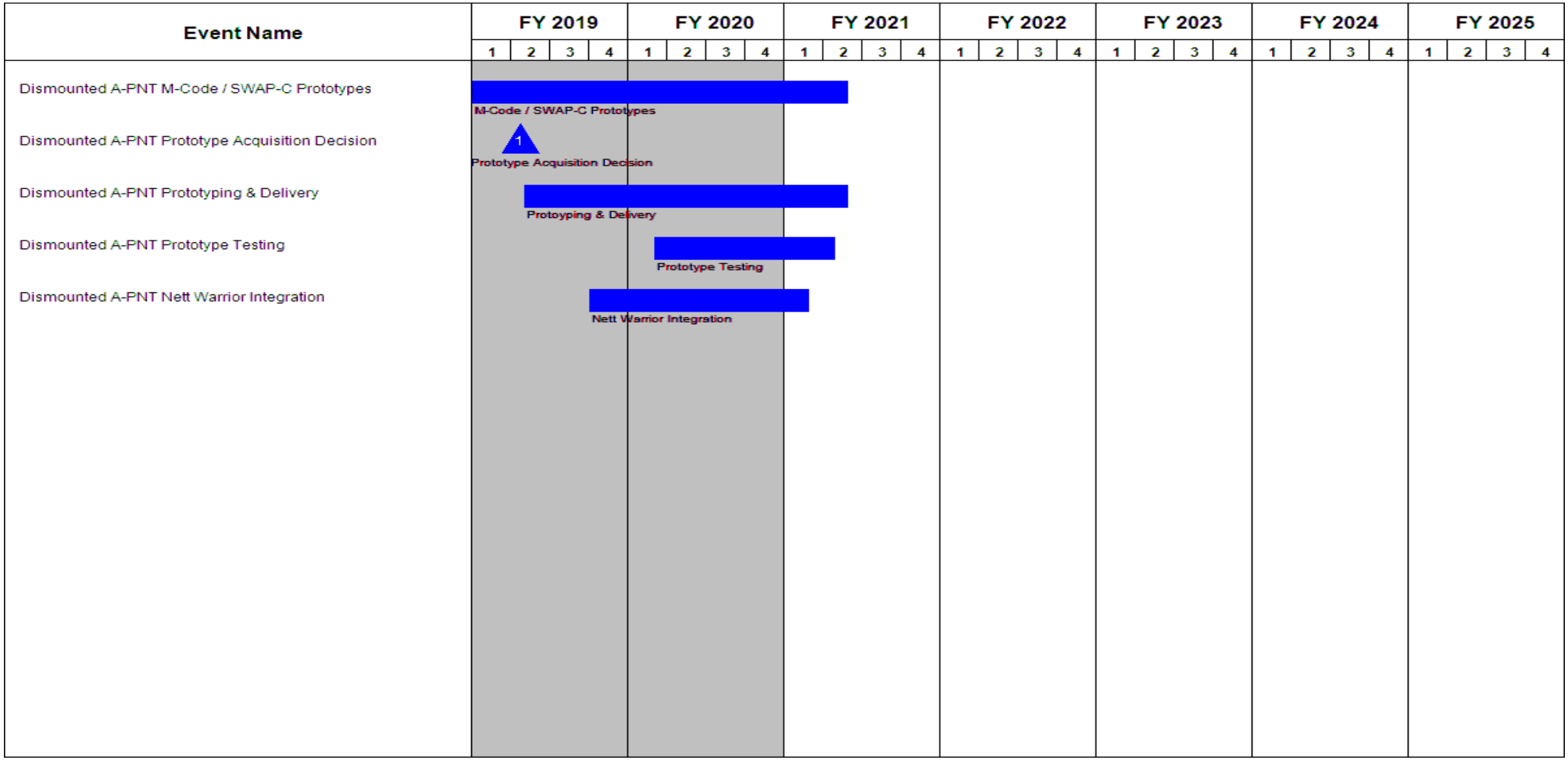

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Dismounted A-PNT M-Code / SWAP-C Prototypes	1	2019	2	2021
Dismounted A-PNT Prototype Acquisition Decision	2	2019	2	2019
Dismounted A-PNT Prototyping & Delivery	2	2019	2	2021
Dismounted A-PNT Prototype Testing	1	2020	2	2021
Dismounted A-PNT Nett Warrior Integration	4	2019	1	2021

Note

Program Element (PE) 1206120A project FJ9 transitions to PE 0604120A project EH8 beginning in FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK1 / *Pseudolites*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FK1: *Pseudolites*	-	0.953	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.953
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Pseudolite project was terminated by the Army on 12 February 2019.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Pseudolites close out ***Description:*** Pseudolites transitioning to Area Protection and Alternative Navigation Technology Development.	0.953	-	-	-	-
Accomplishments/Planned Programs Subtotals	0.953	-	-	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Pseudolite project was terminated by the Army on 12 February 2019.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK1 / *Pseudolites*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	0.953	Dec 2018	-		-		-		-	0.000	0.953	-
		Subtotal	-	0.953		-		-		-		-	0.000	0.953	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.953		0.000		-		-		-	0.000	0.953	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK1 / *Pseudolites*

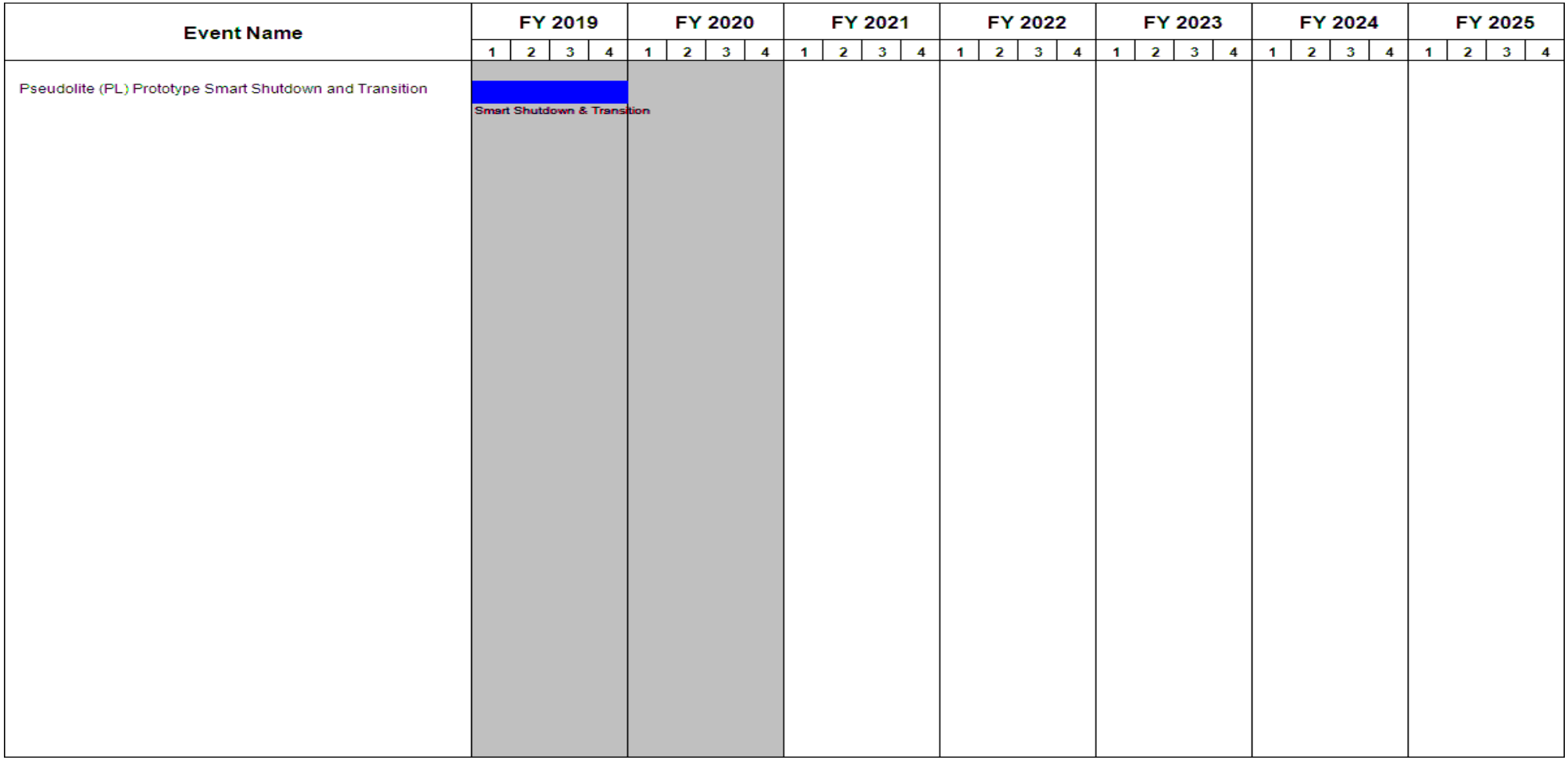

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK1 / *Pseudolites*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Pseudolite (PL) Prototype Smart Shutdown and Transition	1	2019	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK2 / *Mounted A-PNT*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FK2: *Mounted A-PNT*	-	35.775	59.073	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	94.848
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Element (PE) 1206120A project FK2 transitions to PE 0604120A project EJ2 beginning in FY 2021.

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 April 2018.

Mounted Assured Positioning, Navigation and Timing System (MAPS) will provide the Army's ground maneuver forces access to assured PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied. A-PNT products are ruggedized tactical systems which provides electronic protection capabilities that enable combatant commanders the ability to move, shoot, and communicate in a Global Positioning System (GPS) challenged or denied environments. MAPS addresses two critical capability gaps: Access and Integrity. Access is the ability to retrieve accurate PNT information in a contested Electronic Warfare/Cyber environment. Integrity is the ability to trust the PNT data. PNT is a critical enabler of many Army Maneuver, Fire and Command and Control systems that are dependent on accurate Position and Timing.

Mounted Hub A-PNT: The Mounted Assured Positioning, Navigation, and Timing (PNT) System (MAPS) is a platform-mounted, ruggedized tactical PNT system which provides electronic protection capabilities that enable combatant commanders the ability to move, shoot, and communicate in a Global Positioning System (GPS) challenged or denied environments. Included in the MAPS is the Anti-Jam Antenna System (AJAS) which provides GPS signal point protection and PNT Assurance in challenged environments through Anti-Jam technologies. AJAS enables tactical capabilities through assured signal acquisition in challenged environments. The AJAS will assist in delivering distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Mounted A-PNT System (MAPS)	21.055	56.390	-	-	-
Description: This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment.					
FY 2020 Plans: FY 2020 Base funds will support integration, installation, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems.					
FY 2020 to FY 2021 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
RDT&E funding decreased from $66.471 million in FY 2020 to $0.0 million in FY 2021 as it transitions to PE 0604120A project EJ2 beginning in FY 2021.					
Title: FY19 Rescission ***Description:*** FY 2019 pending rescission	14.720	-	-	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	2.683	-	-	-
Accomplishments/Planned Programs Subtotals	35.775	59.073	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• K49030: *Mounted Hub A-PNT*	-	41.728	80.585	12.566	93.151	81.623	153.841	94.775	97.866	Continuing	Continuing

Remarks

K49030 / Mounted Hub A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing

D. Acquisition Strategy

The goal of the Mounted Assured Positioning, Navigation and Timing (PNT) System (MAPS) program is to deliver distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization. The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing a competitive Other Transaction Agreement (OTA) to obtain prototypes. The Government will conduct Electromagnetic Interference and Environmental Testing, as well as performance testing in the System Integration Lab (SIL), anechoic chamber testing and a Military Feasibility Assessment (MFA). The findings from these tests and assessment efforts will determine whether or not to begin platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	C/CPFF	Various : Various	-	1.381	Jan 2019	1.886	Dec 2019	-		-		-	0.000	3.267	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		2.683		-		-		-	0.000	2.683	-
		Subtotal	-	1.381		4.569		-		-		-	0.000	5.950	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mounted/AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	5.045	Sep 2019	10.247	Jan 2020	-		-		-	0.000	15.292	-
Engineering and Technical Product Development	MIPR	C5ISR : APG, MD	-	4.361	Jan 2019	0.842	Dec 2019	-		-		-	0.000	5.203	-
Client and Platform Integration	MIPR	PEO CS&CSS : Various	-	0.975	Apr 2019	29.293	Nov 2019	-		-		-	0.000	30.268	-
Client Software Development (JBCP)	MIPR	AMRDEC/S3I : APG, MD	-	0.544	Jan 2019	-		-		-		-	0.000	0.544	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG, MD	-	-		2.753	Dec 2019	-		-		-	0.000	2.753	-
FY 2019 Pending Rescission	TBD	TBD : TBD	-	14.720		-		-		-		-	0.000	14.720	-
		Subtotal	-	25.645		43.135		-		-		-	0.000	68.780	N/A

Remarks

Client and Platform Integration is required for 81 Platforms and 27 Client PMs.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	0.639	Nov 2018	0.794	Nov 2019	-		-		-	0.000	1.433	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	3.498	Nov 2018	4.485	Nov 2019	-		-		-	0.000	7.983	-
		Subtotal	-	4.137		5.279		-		-		-	0.000	9.416	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Performance Testing	MIPR	C5ISR : Various	-	1.294	Nov 2018	2.111	Nov 2019	-		-		-	0.000	3.405	-
Reliability Testing	MIPR	C5ISR : Various	-	-		1.327	Feb 2020	-		-		-	0.000	1.327	-
Field Testing	MIPR	Army Test and Evaluation Command (ATEC) : White Sands Missile Range (WSMR)	-	0.415	Nov 2018	-		-		-		-	0.000	0.415	-
Military Feasibility Assessment (MFA)	MIPR	Various : TBD	-	-		2.111	Mar 2020	-		-		-	0.000	2.111	-
Systems Engineering and Integration Testing & Support	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	2.903	Oct 2018	0.541	Dec 2019	-		-		-	0.000	3.444	-
		Subtotal	-	4.612		6.090		-		-		-	0.000	10.702	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	35.775		59.073		-		-		-	0.000	94.848	N/A

Remarks

Program Element (PE) 1206120A project FK2 transitions to PE 0604120A project EJ2 beginning in FY 2021. Program schedule continues on PE 0604120A project EJ2.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

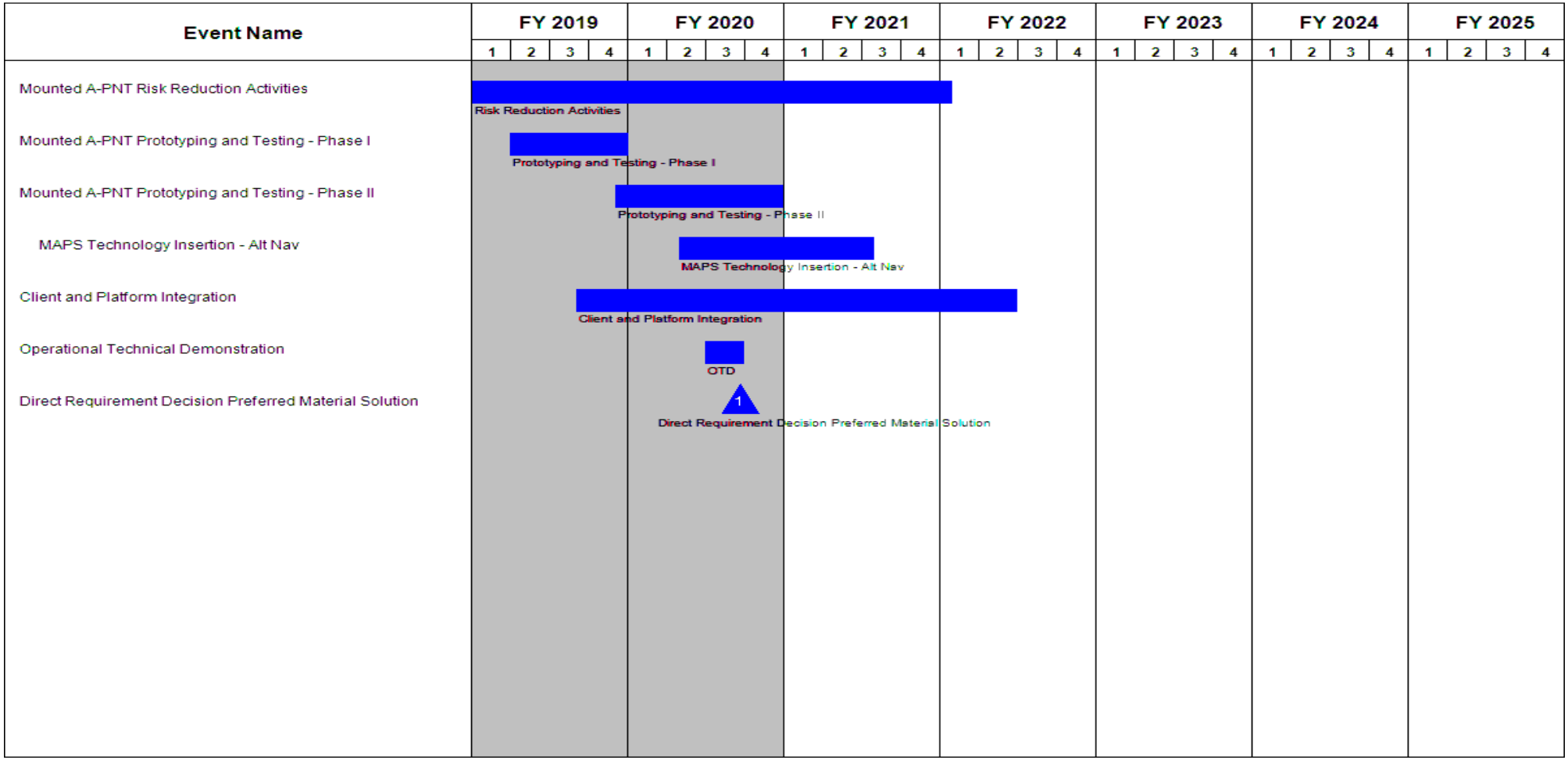

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Mounted A-PNT Risk Reduction Activities	1	2019	1	2022
Mounted A-PNT Prototyping and Testing - Phase I	1	2019	4	2019
Mounted A-PNT Prototyping and Testing - Phase II	4	2019	4	2020
MAPS Technology Insertion - Alt Nav	2	2020	3	2021
Client and Platform Integration	3	2019	2	2022
Operational Technical Demonstration	3	2020	3	2020
Direct Requirement Decision Preferred Material Solution	3	2020	3	2020

Note

Program schedule continues on PE 0604120A project EJ2.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK3 / *Anti-Jam Antenna*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FK3: *Anti-Jam Antenna*	-	8.624	8.900	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	17.524
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Element (PE) 1206120A project FK3 transitions to PE 0604120A project EJ2 beginning in FY 2021.

A. Mission Description and Budget Item Justification

The Anti-Jam Antenna System (AJAS) provides point protection by steering electronic nulls at interference sources or beams at valid signal sources. This enables continuous Global Positioning System (GPS) signal acquisition and tracking in a navigation warfare (jamming) environment. The AJAS is tightly coupled with the Mounted Assured Positioning, Navigation and Timing System (MAPS) to provide GPS signal protection and assured PNT in challenged environments on Army tactical and combat vehicles. The AJAS integration with the MAPS will achieve performance requirements in the highest threat level conditions. These two products each provide a degree of A-PNT protection. Integrated together, however, these two products will close the capability gap and achieve the desired performance.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Anti-Jam Antenna System ***Description:*** This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment. ***FY 2020 Plans:*** FY 2020 Base funds will support integration, installation, training and Soldier Assessment of AJAS fielded with MAPS, on selected combat vehicles and command, control and communication systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** RDT&E funding decreased from $8.9 million in FY 2020 to $0.0 million in FY 2021 as it transitions to PE 0604120A project EJ2 beginning in FY 2021.	8.259	8.496	-	-	-
Title: FY19 Rescission ***Description:*** FY 2019 Pending Rescission	0.365	-	-	-	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638	-	0.404	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	8.624	8.900	-	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The goal of the Anti-Jam Antenna System (AJAS) program is to deliver distributed A-PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization. The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing a competitive Other Transaction Agreement (OTA) to obtain prototypes. The Government will conduct partial Electromagnetic Interference and Environmental Testing, as well as performance testing in the System Integration Lab (SIL), anechoic chamber testing and a Military Feasibility Assessment. The findings from these test and assessment efforts will determine whether or not to proceed to platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK3 / *Anti-Jam Antenna*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Support - Contractor	C/CPFF	Various : Various	-	0.338	Jan 2019	0.218	Dec 2019	-		-		-	0.000	0.556	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.404		-		-		-	0.000	0.404	-
		Subtotal	-	0.338		0.622		-		-		-	0.000	0.960	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development of the Systems Engineering and Integration Lab	MIPR	CERDEC Command Power and Integration Lab : APG, MD	-	-		0.209	Dec 2019	-		-		-	0.000	0.209	-
Engineering and Technical Product Development	MIPR	C5ISR : APG,MD	-	1.970	Jan 2019	-		-		-		-	0.000	1.970	-
Mounted and AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	2.231	Sep 2019	-		-		-		-	0.000	2.231	-
Client Software Development (JBCP)	MIPR	AMERDEC/S3I Directorate : APG,MD	-	-		3.263	Nov 2019	-		-		-	0.000	3.263	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG,MD	-	-		2.925	Dec 2019	-		-		-	0.000	2.925	-
FY 2019 Pending Rescission	TBD	TBD : TBD	-	0.365	May 2019	-		-		-		-	0.000	0.365	-
		Subtotal	-	4.566		6.397		-		-		-	0.000	10.963	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK3 / *Anti-Jam Antenna*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	0.034	Dec 2018	0.063	Nov 2019	-		-		-	0.000	0.097	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	2.076	Jan 2019	1.818	Nov 2019	-		-		-	0.000	3.894	-
		Subtotal	-	2.110		1.881		-		-		-	0.000	3.991	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Live Sky Demo and Antenna Anechoic Chamber Test	MIPR	CERDEC - Command Power and Integration Directorate : APG, MD	-	0.384	Dec 2018	-		-		-		-	0.000	0.384	-
Anti-Jam Antenna Integrity/ Performance Testing	MIPR	CERDEC STCD : APG,MD	-	1.098	Nov 2018	-		-		-		-	0.000	1.098	-
TNT Prototype testing	MIPR	CERDEC STCD : APG, MD	-	0.128	Nov 2018	-		-		-		-	0.000	0.128	-
		Subtotal	-	1.610		-		-		-		-	0.000	1.610	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	8.624		8.900		-		-		-	0.000	17.524	N/A

Remarks

Program Element (PE) 1206120A project FK3 transitions to PE 0604120A project EJ2 beginning in FY 2021. Program schedule continues on PE 0604120A project EJ2.

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

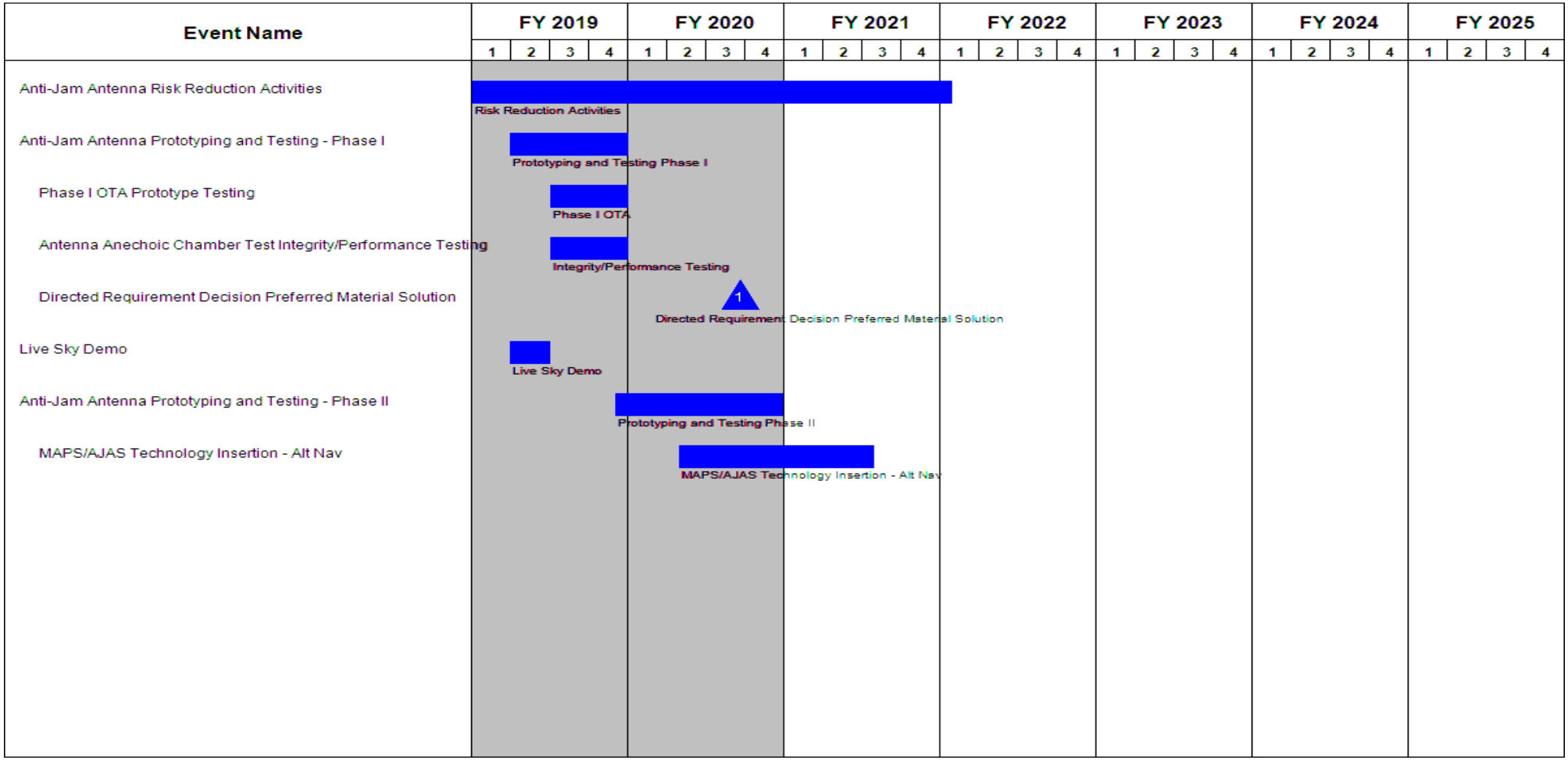

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Anti-Jam Antenna Risk Reduction Activities	1	2019	1	2022
Anti-Jam Antenna Prototyping and Testing - Phase I	1	2019	4	2019
Phase I OTA Prototype Testing	3	2019	4	2019
Antenna Anechoic Chamber Test Integrity/Performance Testing	3	2019	4	2019
Directed Requirement Decision Preferred Material Solution	3	2020	3	2020
Live Sky Demo	1	2019	2	2019
Anti-Jam Antenna Prototyping and Testing - Phase II	4	2019	4	2020
MAPS/AJAS Technology Insertion - Alt Nav	2	2020	3	2021

Note

Program schedule continues on PE 0604120A project EJ2.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206308A / *Army Space Systems Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	45.420	104.996	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
FE5: *Space And Missile Defense Integration*	-	24.326	104.996	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
FE6: *Army Space System Enhancement/Integration*	-	21.094	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.094

A. Mission Description and Budget Item Justification

This Program Element (PE) funds space systems integration efforts performed by the US Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) and the Program Executive Office for Intelligence, Electronic Warfare (PEO IEW&S) to develop and field space superiority capabilities.

Project FE5: Funds USASMDC/ARSTRAT to integrate warfighting concepts and technologies, validate concepts, and identify capabilities needed to implement the validated concepts, and develop DOTMLPF solutions to realize those space and high altitude related capabilities. Provide engineering support to the Joint Friendly Force Tracking (J-FFT) Mission Management Center (MMC) through an associated test-bed for both operational and developmental injection and integration of real-time J-FFT information into the Common Operating Picture (COP) for Combatant Commanders (CCMDs), Joint Task Forces (JTFs), and Coalition Partners. The MMC injects real-time J-FFT information into the COP for CCMDs, JTFs and Coalition partners. USSTRATCOM, in accordance with CJCSI 3910.01 (reference V.4.) is designated one of three coordinating agencies for J-FFT within DoD. CJCSI 3910.01 directs eight Force Modernization tasks to USSTRATCOM. USSTRATCOM SI 534-5 (reference V.6.) and annually published USSTRATCOM operations orders have designated USASMDC/ARSTRAT as the lead USSTRATCOM component command for Friendly Force Tracking (FFT).

Project FE6: Details of this program are reported in accordance with Title 10, United States Code, Section 119 (a)(1).

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	38.307	104.996	23.168	-	23.168
Current President's Budget	45.420	104.996	0.000	-	0.000
Total Adjustments	7.113	0.000	-23.168	-	-23.168
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	7.113	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-23.168	-	-23.168

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206308A *I Army Space Systems Integration*

Change Summary Explanation

FY2020 FWC direct funding ($14.62M) supports the assured position, navigation and timing cross functional team (APNT CFT) Low Earth Orbit tactical space layer strategy ($58.776M); capability development support to the assured APNT CFT efforts to develop PNT situational awareness, develop alternative PNT sources and deny adversary use of PNT ($20.0M); and, TF EAGLE's execution of Consolidated SATCOM System Expert (CSS-E) System Tool ($11.6M). The overall FWC decrease is a function of balancing between the FWC and APNT CFT funding for FY2020. Once Project FE5 funding transfers to Project 990 in FY2021 (see separate 990 R-Form), FWC is expected to realize an increase of $2.789M for the APNT bridging effort plus fact-of-life inflationary adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206308A / *Army Space Systems Integration*	Project (Number/Name) FE5 / *Space And Missile Defense Integration*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FE5: *Space And Missile Defense Integration*	-	24.326	104.996	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This project transitions to 0603308A / 990.

A. Mission Description and Budget Item Justification

The Friendly Force Data Integration and Management (FFDIM) Capability Definition Package (CDP), a Joint Capabilities Integration and Development System (JCIDS) requirements document (October 2017) validated the Joint Friendly Force Tracking (JFFT) Testbed's development, testing and integration capabilities and Friendly Force Tracking (FFT) System Expert support provided by U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) as U.S. Strategic Command's (USSTRATCOM's) Army Service Component Command (ASCC). In addition, Chairman of the Joint Chiefs of Staff Instruction 3910 (FFT Operations Guidance) directs USSTRATCOM's ASCC to execute eight specified FFT mission support responsibilities that include providing a testing and development capability to support joint, interagency and coalition partners FFT operations. USASMDC/ARSTRAT: Headquarters, Department of the Army General Order 37, dated 16 October 2006, designated USASMDC/ARSTRAT as the Army proponent for space, the Army integrator for global missile defense (GMD), and the Army Service Component Command (ASCC) of the USSTRATCOM. Army Regulation (AR) 10-87, Army Commands, Army Service Component Commands, and Direct Reporting Units, dated 4 September 2007, and AR 5-22, The Army Force Modernization Proponent System, dated 19 August 2009, designated USASMDC/ARSTRAT as the Army specified proponent for Space/High Altitude capabilities. As the Army proponent for space and high altitude, USASMDC/ARSTRAT is responsible for developing warfighting concepts, conduct warfighting experiments to validate those concepts, identify capabilities needed to implement the validated concepts, and develop Doctrine, Organizations, Training, Material, Leadership & Education, Personnel, Facilities and Policy (DOTMLPF-P) solutions.

Project FE5 funds USASMDC/ARSTRAT efforts to develop, analyze and mature warfighting concepts, and conduct warfighting experiments for space and high altitude capabilities. USASMDC/ARSTRAT is the proponent for space/high altitude capabilities and is responsible for determining and integrating DOTMLPF-P for the Army. The program also funds development and integration of new data sources and services into the JFFT Mission Management Center (MMC), providing users FFT information system services at the highest Mission Assurance Category level (MAC 1). Software products developed and deployed by the JFFT Testbed into the MMC enable the receipt, integration and dissemination of real-time FFT information to the Common Operating Picture (COP) displays for Combatant Commanders, Joint Task Forces and coalition partners. JFFT Subject Matter Expert support to critical FFT interoperability assessments and development activities with coalition partners are supporting DOD's priority of strong alliances and partnerships. Integrated FFT data solutions developed by JFFT Testbed enable FFT data for COP display and Situational Awareness between Army forces and Unified Action Partners. The JFFT Testbed will continues to leverage FFT systems expertise and reduce Department of Defense costs by supporting numerous efforts, including the joint Personnel Recovery community response to a Joint Urgent Operational Needs Statement to resolve critical issues in isolated persons reporting and locating.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206308A / *Army Space Systems Integration*	**Project (Number/Name)** FE5 / *Space And Missile Defense Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Architecture Development, Wargames and Demonstrations	10.440	8.797	-
Description: Funding is provided for planning, developing, and executing architectures and combat development solutions for Army integration of space systems, space control capabilities, missile defense, and high altitude systems. ***FY 2020 Plans:*** Expand upon FY 2019 developments to plan, develop, and execute architectures and combat development solutions for Army integration of space systems, space control capabilities, and high altitude systems. As the Army Executive Agent for Space Program Assessments, represent Army positions and defend Army equities relative to space and high altitude domains in Joint/ DoD and inter-Service forums. Plan and execute wargames to evaluate emerging concepts within the space and high altitude domains as well as participate and provide support to Army and Joint wargames and experiments where space and high altitude capabilities and technologies can be integrated and evaluated in the most realistic operating environment possible. Ensure that space, high altitude and cyber capability gaps are identified and capabilities are correctly represented so that the Army's use of these capabilities is explored and where possible, exploited. Develop space modernization strategies and sponsor exploration of future space and high altitude warfighting concepts. USASMDC/ARSTRAT Future Warfare Center (FWC) will continue efforts to enhance the resiliency and effectiveness of critical space-based assets and JCIDS capability development activities for space superiority, high altitude persistent platforms, nano-satellites and tactical launch systems. Will develop Space and High Altitude JCIDS documents including Initial Capabilities Documents or Capability Development Documents, and Capability Production Documents (CPD) to update system Operational Requirements Documents. Develop a space superiority CPD and continue to develop the JCIDS documentation required to Integrate space and high altitude capabilities into Multi-Domain Task Force (MDTF). USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY 2020. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decreased as FE5 restructured to PE 0603308A 990 in FY 2021			
Title: Joint Friendly Force Tracking (J-FFT) Testbed	2.526	1.487	-
Description: Funding is provided to enable the Joint Friendly Force Tracking (J-FFT) Testbed to develop and integrate Combat Commanders' FFT and Hostile Force Tagging, Tracking, and Locating (HF TTL) requirements into existing and future command and control network architectures, leveraging network enabled command and control system enhancements, and continuing to support development of FFT capabilities for deployed and coalition forces. ***FY 2020 Plans:*** The JFFT Testbed will provide agile capabilities development and integrated solutions to validated requirements that enable interoperable force tracking data exchange and satisfy joint, agency and coalition warfighting needs for timely, accurate Common Operational Picture (COP) displays and decision making. JFFT development will continue to respond to the growth in FFT device			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
use by enabling the number of device types supported by the MMC and increased data architectures, expanding user groups. For operational deployment to the Joint Force Tracking Mission MMC's 24/7 data services, the JFFT Testbed is scheduled to develop and deliver new capabilities including command and control messaging, new data sources and devices, and the ratified NATO message standard for FFT. Also planned is the re-design and implementation of needed upgrades to the Force Tracking Web product, fulfilling requirements for added functionality in data visualization and management. JFFT will continue to exploit, expand and provide mission owners with approved infrastructures (classified and unclassified) that achieve improved performance and reduce costs. JFFT Testbed will remain a key contributor to support North Atlantic Treaty Organization Capability Team activities and other coalition assessments and exercises that advance US and coalition FFT interoperability. USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY 2020. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decreased as FE5 restructured to PE 0603308A 990 in FY 2021			
Title: Organizational Development as Part of the SRC40 Proponecy Mission ***Description:*** Continue participation in the Force Design Update (FDU) process. Development of Operational & Organizational (O&O) Concept Papers, Organization Design Papers, Cost Benefit Analyses, Unit Reference Sheets (URS), and Manpower Requirements Criteria (MARC) determination. ***FY 2020 Plans:*** Continue to participate in the Force Design Update (FDU) process. The U.S. Army Space and Missile Defense Command/ Army Forces Strategic Command (USASMDC/ARSTRAT) Space and Missile Defense Center of Excellence (SMDCoE)will participate in the recurring process used to gain HQDA approval of organizational structure changes and designs through the FDU and FDU Jr. processes. This includes the development of Operational & Organizational Concept Papers, Organization Design Papers, Cost Benefit Analyses, Unit Reference Sheets, and Manpower Requirements Criteria determination. Participate in the Total Army Analysis (TAA), the Army's annual process to examine the projected Army force qualitatively and quantitatively. USASMDC/ARSTRAT will support TAA Rule of Allocation development, Capability Demand Analysis and Resourcing phases to ensure SRC40 units are properly accounted for in the future Program Objectives Memorandum (POM) Force. This is performed to analyze the projected Army Force against future demands and levels of funding/authorizations to build the POM Force. USASMDC/ARSTRAT SMDCOE will review the USASMDC/ARSTRAT Troops, Organization and Equipment (TOE) requirements documents conducted as part of a cyclic process as well when needed during other Force Design processes (i.e.-Basis of Issue Plan (BOIP) Modernization Path (MODPATH) reviews, Notification of Change reviews, SSN-LIN Automated Management and Integrating System (SLAMIS) reviews, etc.). Participate in BOIP Development. BOIP Development is collection of processes including the cyclic review of Army-wide BOIPs under development, development of Feeder Data for USASMDC/ARSTRAT proponent item BOIPs, and validation of BOIP MODPATHs to USASMDC/ARSTRAT TOEs. Complete the Space Forces Force Structure Review which is a Cost-Benefit Analysis-like structured three-phased process consisting of a Needs Analysis, Gap	1.450	0.312	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Analysis, and Solutions Analysis to identify and document organizational based capability needs and gaps, develop a prioritized list of those gaps, and identify potential materiel and/or non-materiel solutions. USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY 2020. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decreased as FE5 restructured to PE 0603308A 990 in FY 2021			
Title: Position, Navigation, and Timing Navigation Warfare (PNT/NAVWAR) ***Description:*** Identifying and advocating for positioning, navigation, and timing (PNT) and Navigation Warfare (NAVWAR) requirements through CDR USSTRATCOM to the Joint Staff to establish and formalize joint NAVWAR requirements, in the Joint Capabilities Integration and Development System (JCIDS) process. Continuing to identify and advocate for PNT and NAVWAR emerging requirements through Commander, U.S. Strategic Command to the Joint Staff to establish and formalize joint NAVWAR requirements, in the JCIDS process and supporting the Army Assured Positioning Navigation and Timing (APNT) Cross Functional Team by conducting required capability analysis and developing JCIDS documents for its three Lines of Effort: Assured PNT, Navigation Warfare, and Space. USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY 2020. ***FY 2020 Plans:*** Based on the results of our efforts in FY 2019 the Future Warfare Center will continue to identify and advocate for PNT and NAVWAR emerging requirements through Commander, U.S. Strategic Command to the joint staff to establish and formalize joint NAVWAR requirements, in the JCIDS process. Support the Army Assured Positioning Navigation and Timing (APNT) Cross Functional Team by conducting required capability analysis and developing JCIDS documents for APNT Enabling systems and APNT Situational Awareness. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decreased as FE5 restructured to PE 0603308A 990 in FY 2021	2.410	1.072	-
Title: Narrowband C-SSE enterprise level capability to monitor, detect, and assess UHF SATCOM interference ***Description:*** Developing and deploying Narrowband Consolidated SATCOM System Expert (C-SSE) SATCOM Tools that will allow the U.S. Army to fight SATCOM. The USASMDC/ARSTRAT NB C-SSE Division executes the SATCOM electromagnetic interference (EMI) mission in support of CCMDs, Services, Agencies, and Warfighters. Two critical elements of that support are to provide NB EMI management and Space Situation Awareness. Once fully developed and operational, coupled with a sustainment plan, this will improve the joint commander's ability to "fight SATCOM" in a contested environment. ***FY 2020 Plans:*** Fully develop and deploy Narrowband C-SSE SATCOM Tools that will allow the U.S. Army to fight SATCOM. The USASMDC/ ARSTRAT NB C-SSE Division executes the SATCOM electromagnetic interference (EMI) mission in support of CCMDs, Services,	-	10.862	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Agencies, and Warfighters. Two critical elements of that support are to provide NB EMI management and Space Situation Awareness. Once fully developed and operational, coupled with a sustainment plan, this will improve the joint commander's ability to "fight SATCOM" in a contested environment. USASMDC/ARSTRAT will execute these funds in FY 2020. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** No funding in FY 2021.			
Title: Low Earth Orbit Strategy ***Description:*** A dedicated constellation of small satellites to provide resilient, persistent LEO capability to address shortfalls in current reconnaissance, surveillance, and target acquisition (RSTA) and PNT systems. Provides the ability to identify and locate targets of interest in denied and contested environments actionable to the tactical warfighter. This includes the Battle Management, Command and Communication (BMC2) capability required to task payloads and fuse data, as well as algorithms to enhance, analyze, and disseminate this data to the tactical warfighter via existing Army systems and networks in support of Sensor-to-Shooter demonstrations directly supporting Long Range Precision Fires (LRPF). ***FY 2020 Plans:*** Low Earth Orbit (LEO) Strategy Begin validation of demonstration constellation in a realistic operational environment. Evaluate the integrated RSTA, PNT, BMC2, and communications technologies to identify and locate targets of interest in denied and contested environments actionable to the tactical warfighter. Amount of this effort in FY 2020 - 59,500. Title: APNT Integrated Space Communications Description: Development of a unique advanced space communications capability to explore advanced ground based space communications technologies and concepts utilizing bi-static Radio Frequency (RF) scattering and propagation with precision frequency, phase, and power management. This space communications capability will develop and demonstrate multiple advanced Army LEO space communications concepts and will also assess interfacing with multiple Joint Service space communication missions. FY 2020 Plans: Assess performance of space communications capabilities of multiple advanced Army LEO space communications concepts and interfacing with multiple Joint Services. FY 2020 Amount 20,000 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funds decreased as FE5 restructured to PE 0604035A BX7 in FY 2021	7.500	78.039	-
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:***	-	4.427	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	24.326	104.996	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army			Date: February 2020
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Personnel and operations support.	TBD	SMDC/ARSTRAT Huntsville, AL and Colorado Springs : SMDC/ARSTRAT Huntsville, AL and Colorado Springs	-	16.826		6.250		-		-		-	0.000	23.076	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		4.427		-		-		-	0.000	4.427	-
		Subtotal	-	16.826		10.677		-		-		-	0.000	27.503	N/A

Remarks

N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contracts for Experiments & technology enhancements of prototypes/tools and analysis	Various	SMDC/ARSTRAT Huntsville, AL and Colorado Springs : SMDC/ARSTRAT Huntsville, AL and Colorado Springs	15.655	-		17.018		-		-		-	0.000	32.673	-
Low Earth Orbit	C/Various	Various : Huntsville AL, Wilmngton, MA, Boulder CO, VA	-	7.500		77.301		-		-		-	0.000	84.801	-
		Subtotal	15.655	7.500		94.319		-		-		-	0.000	117.474	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	15.655	24.326		104.996		-		-		-	0.000	144.977	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206308A / *Army Space Systems Integration*	**Project (Number/Name)** FE5 / *Space And Missile Defense Integration*

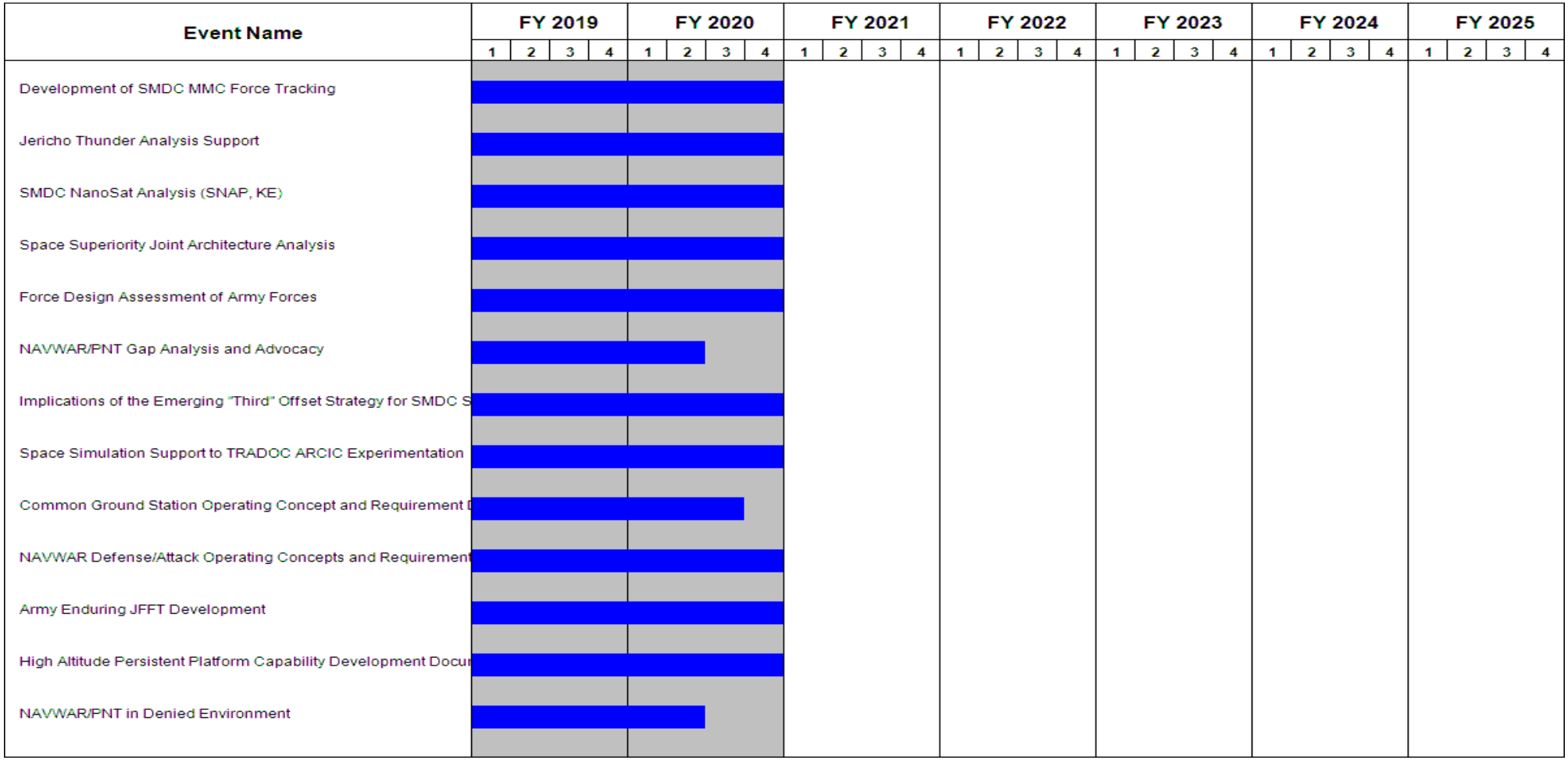

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206308A / *Army Space Systems Integration*	**Project (Number/Name)** FE5 / *Space And Missile Defense Integration*

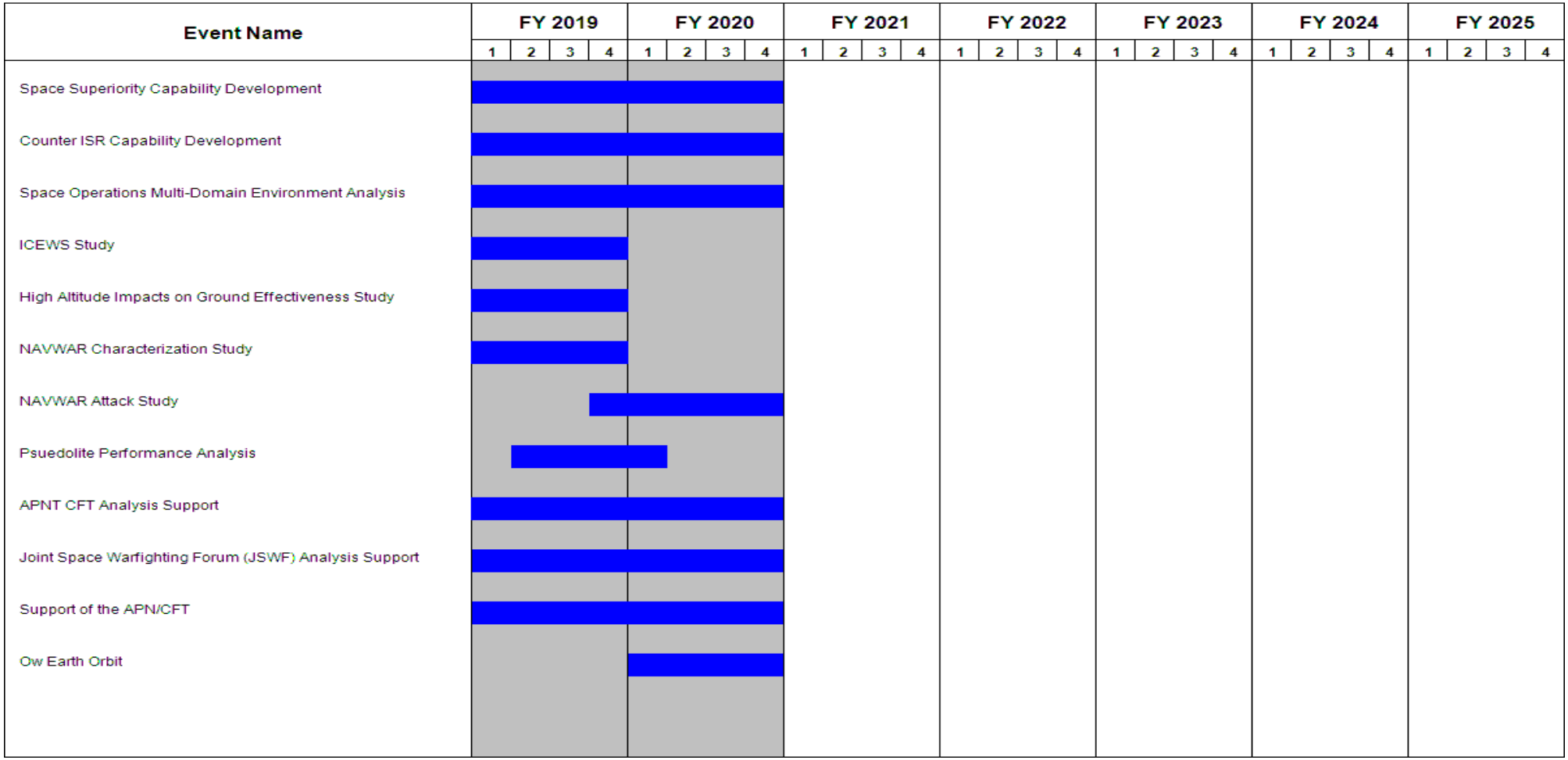

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
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Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Development of SMDC MMC Force Tracking	1	2018	4	2020
Jericho Thunder Analysis Support	1	2019	4	2020
SMDC NanoSat Analysis (SNAP, KE)	1	2019	4	2020
Space Superiority Joint Architecture Analysis	1	2018	4	2020
Force Design Assessment of Army Forces	1	2019	4	2020
NAVWAR/PNT Gap Analysis and Advocacy	1	2018	2	2020
Implications of the Emerging "Third" Offset Strategy for SMDC Space	1	2019	4	2020
Space Simulation Support to TRADOC ARCIC Experimentation	1	2018	4	2020
Common Ground Station Operating Concept and Requirement Document	1	2019	3	2020
NAVWAR Defense/Attack Operating Concepts and Requirements Documentation	1	2018	4	2020
Army Enduring JFFT Development	1	2018	4	2020
High Altitude Persistent Platform Capability Development Document	1	2018	4	2020
NAVWAR/PNT in Denied Environment	1	2019	2	2020
Space Superiority Capability Development	1	2018	4	2020
Counter ISR Capability Development	3	2017	4	2020
Space Operations Multi-Domain Environment Analysis	4	2017	4	2020
ICEWS Study	4	2018	4	2019
High Altitude Impacts on Ground Effectiveness Study	4	2018	4	2019
NAVWAR Characterization Study	4	2018	4	2019
NAVWAR Attack Study	4	2019	4	2020
Psuedolite Performance Analysis	2	2019	1	2020
APNT CFT Analysis Support	3	2018	4	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
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	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Joint Space Warfighting Forum (JSWF) Analysis Support	1	2018	4	2020
Support of the APN/CFT	1	2018	4	2020
Ow Earth Orbit	1	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 1206308A / *Army Space Systems Integration*				Project (Number/Name) FE6 / *Army Space System Enhancement/ Integration*			
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
FE6: *Army Space System Enhancement/Integration*	-	21.094	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.094
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The details of this program are reported in accordance with Title 10, United States Code, Section 119(a)(1).