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**Department of Defense
Fiscal Year (FY) 2020 Budget Estimates**

March 2019



Army

Justification Book of

Research, Development, Test & Evaluation, Army

RDT&E – Volume II, Budget Activity 4

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Army • Budget Estimates FY 2020 • RDT&E Program

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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, \$12,396,895,000.00 to remain available for obligation until September 30, 2021.

OCO for Direct War Costs (\$182,624,000.00): Direct War costs are those combat or direct combat support costs that will not continue to be expended once combat operations end at major contingency locations.

OCO for Enduring Requirements (\$21,500,000.00): OCO for Enduring Requirements are enduring in-theater and in-CONUS costs that will likely remain after combat operations cease, and have previously been funded in OCO.

COST STATEMENT

The following Justification Books were prepared at a cost of \$366,803: 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 6, and Budget Activity 7.

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FY 2020 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 2020 Budget Submitted to Congress to the FY 2019 Budget Submitted to Congress.** This paragraph provides a list of program elements/projects that are major new starts, restructures, developmental transitions, and terminated programs. Explanations for these changes can be found in the narrative sections of the Program Element R-2A Exhibits.

New Start Programs:

<i>Budget Activity</i>	<i>OSDPE / Project</i>	<i>Project Title</i>
02	0602145A / BJ9	Autonomous Mobility Tech
02	0602145A / BK2	Virtual Prototyping Technology
02	0602145A / BK3	Next Gen Intelligent Fire Control (NG-IFC) Tech
02	0602145A / BK5	Adv Direct In-Direct Armament Sys (ADIDAS) Tech
03	0603002A / MM7	Enabling Med Cap to Support Dispersed OPS Adv Tech
04	0603619A / BU5	Standoff Volcano Obstacle (SAVO) Adv Tech
04	0603639A / EU3	.50 Caliber All-Purpose Tactical Cartridge (APTC)
04	0603774A / VT8	SOLDIER PRECISION TARGETING DEVICES - ADV DEV
04	0603827A / CF2	Integrated Soldier Systems Prototyping (SL CFT)
04	0604021A / AW7	Electronic Warfare Technology Maturation (MIP)
04	0604115A / AX8	Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)
04	0604115A / AX9	Adv Mobility Experimental Prototype Adv Tech
04	0604115A / AY1	MUM-T Platform Enabler
04	0604115A / AY2	Army Operational Fires
04	0604115A / AY3	Strategic Long Range Cannon
04	0604182A / HX1	Land-Based Hypersonic Missile

04	0604403A / FM3	Future Interceptor
04	0604541A / BT1	Interoperability
04	0604541A / BT2	Command Post Mobility/Survivability
04	0604541A / BT3	Common Operating Environment (COE)
04	0604541A / BT4	Network Technology Maturation Initiatives (NTMI)
04	0604541A / BT5	Integrated Tactical Network/Enterprise Network
04	0604644A / MR1	Mobile Medium Range Missile
05	0604601A / CF3	Integrated Soldier Systems (SL CFT)
05	0604802A / EP2	Shoulder-Launched Munitions
05	0604827A / FK4	Soldier Borne Sensor (SBS)
05	0604854A / HB6	Mobile Howitzer
05	0605041A / CY5	CYBER Situational Understanding
05	0605625A / CF6	Next Generation Combat Vehicle (NGCV)
07	0205778A / EG2	GMLRS Alternative Warheads
07	0607145A / FD5	Apache Product Improvement
07	1203142A / FI8	Protected Anti-JAM Tactical SATCOM

Program Element/Project Restructures:

<u>Budget Activity</u>	<u>Old OSDPE / Project: Title</u>	<u>New OSDPE / Project</u>
01	0601101A / 91A: ILIR-AMC	0601102A / AA1
01	0601101A / F16: ILIR-SMDC	0601102A / AA2
01	0601102A / 305: ATR Research	0601102A / AA9
01	0601102A / 31B: Infrared Optics Rsch	0601102A / AA8
01	0601102A / 52C: Mapping & Remote Sens	0601102A / AB2
01	0601102A / 53A: Battlefield Env & Sig	0601102A / AA7
01	0601102A / 74A: Human Engineering	0601102A / AA4
01	0601102A / 74F: Pers Perf & Training	0601102A / AA4

01	0601102A / ET6: BASIC RESCH IN CLINICAL & REHABILITATIVE MED	0601102A / AB1
01	0601102A / F20: Adv Propulsion Rsch	0601102A / AA6
01	0601102A / F22: Rsch In Veh Mobility	0601102A / AA6
01	0601102A / H42: Materials & Mechanics	0601102A / AA7
01	0601102A / H43: Research In Ballistics	0601102A / AA7
01	0601102A / H44: Adv Sensors Research	0601102A / AA5, AA7, & AA8
01	0601102A / H45: Air Mobility	0601102A / AA6
01	0601102A / H47: Applied Physics Rsch	0601102A / AA9
01	0601102A / H48: Battlespace Info & Comm Rsc	0601102A / AA9
01	0601102A / H52: Equip For The Soldier	0601102A / AA8
01	0601102A / H57: Single Investigator Basic Research	0601102A / AA3
01	0601102A / H66: Adv Structures Rsch	0601102A / AA6
01	0601102A / H67: Environmental Research	0601102A / AA7
01	0601102A / S13: Sci BS/Med Rsh Inf Dis	0601102A / AB1
01	0601102A / S14: Sci BS/Cbt Cas Care Rs	0601102A / AB1
01	0601102A / S15: Sci BS/Army Op Med Rsh	0601102A / AB1
01	0601102A / T22: Soil & Rock Mech	0601102A / AB2
01	0601102A / T23: Basic Res Mil Const	0601102A / AB2
01	0601102A / T24: Signature Physics And Terrain State Basic Research	0601102A / AB2
01	0601102A / T25: Environmental Science Basic Research	0601102A / AB2
01	0601102A / T63: Robotics Autonomy, Manipulation, & Portability Rsh	0601102A / AA6
01	0601102A / T64: Sci BS/System Biology And Network Science	0601102A / AB1
01	0601102A / VR9: Surface Science Research	0601102A / AA7
01	0601103A / D55: University Research Initiative	0601103A / AB3
01	0601104A / EA6: Cyber Collaborative Research Alliance	0601104A / AB7
01	0601104A / F17: Neuroergonomics Collaborative Technology Alliance	0601104A / AB7
01	0601104A / FF5: Distributed Collaborative Intelligent Systems CTA	0601104A / AB7
01	0601104A / FF7: Internet of Battlefield Things CTA	0601104A / AB7
01	0601104A / H04: HBCU/MI Programs	0601104A / AB4

01	0601104A / H05: Institute For Collaborative Biotechnologies	0601104A / AB7 & AB4
01	0601104A / H59: International Tech Centers	0601104A / AC6
01	0601104A / H73: Automotive Research Center (ARC)	0601104A / AB4
01	0601104A / J08: Institute For Creative Technologies (ICT)	0601104A / AB4
01	0601104A / J12: Institute For Soldier Nanotechnology (ISN)	0601104A / AB4
01	0601104A / J14: Army Educational Outreach Program	0601104A / AB8
01	0601104A / J15: Network Sciences ITA	0601104A / AB7
01	0601104A / J17: Vertical Lift Research Center Of Excellence	0601104A / AB4
01	0601104A / VS2: Multi-Scale Materials Modeling Centers	0601104A / AB7
01	0601104A / VS3: Center For Quantum Science Research	0601104A / AB7
02	0602105A / H84: Materials	0602141A / AH8, 0602143A / AZ5 & BE6, 0602145A / BI4
02	0602105A / XW4: Manufacturing Science	0602144A / BL1
02	0602120A / H16: S3I Technology	0602145A / BI2, 0602146A / AP5 & AR1, 0602148A / AL8, 0602150A / AD5
02	0602120A / TS1: Tactical Space Research	0602146A / AO5
02	0602120A / TS2: Robotics Technology	0602145A / BF8
02	0602211A / 47A: AERON & ACFT Wpns Tech	0602148A / AJ6, AJ4, AJ8, AM2, AI7, AK2, AL2, AI5, AJ2, AK1
02	0602211A / 47B: Veh Prop & Struct Tech	0602148A / AK9, AL5, AI9, AL4
02	0602270A / 906: Tactical Electronic Warfare Applied Research	0602146A / AN7, AO2, 0602148A / AK2
02	0602270A / CYB: Applied Offensive Cyber	0602146A / AQ3
02	0602303A / 214: Missile Technology	0602147A / AF8, AF3, AG2, AE7, AG1, AG9, AF9, AF5, AH2, AF6, AF7, 0602148A / AK4, 0602150A / AD3, AD7
02	0602307A / 042: High Energy Laser Technology	0602150A / AC9
02	0602308A / C90: Advanced Distributed Simulation	0602143A / BC3, BE8, 0602145A / BF6
02	0602308A / D02: Modeling & Simulation For Training And Design	0602143A / BE8
02	0602601A / C05: Armor Applied Research	0602145A / BG6, BH9
02	0602601A / H77: National Automotive Center	0602145A / BJ3, BI9
02	0602601A / H91: Ground Vehicle Technology	0602145A / BF1, BF3, BF6, BH7, BH5
02	0602618A / H80: Survivability And Lethality Technology	0602141A / AH5, AH6, AH7, 0602143A / AY6, 0602145A / BG6, 0602147A / AH4
02	0602622A / 552: Smoke/Novel Effect Mun	0602144A / BL2, 0602145A / BG8

02	0602623A / H21: Jt Svc Sa Prog (JSSAP)	0602143A / AY6
02	0602624A / H18: Weapons & Munitions Technologies	0602147A / AG6, AG4, BN4, 0602148A / AK6
02	0602624A / H28: Warheads/Energetics Technologies	0602145A / AH9, 0602147A / AG8, AG6, 0602148A / AK2
02	0602705A / EM8: High Power And Energy Component Technology	0602145A / BH7, 0602146A / AP4, AO2, 0602150A / AD2
02	0602705A / H11: Tactical And Component Power Technology	0602143A / BD8, 0602148A / AM4
02	0602705A / H94: Elec & Electronic Dev	0602144A / BL1, 0602146A / AV9, AO4, AV5, 0602148A / AK2
02	0602709A / H95: Night Vision And Electro-Optic Technology	0602143A / BD1, 0602145A / BH2, BF9, BJ2, 0602148A / AK2
02	0602712A / H24: Countermine Tech	0602143A / BD1, 0602144A / BL4, 0602145A / BJ7
02	0602712A / H35: Camouflage & Counter-Recon Tech	0602145A / BI2
02	0602716A / H70: Human Fact Eng Sys Dev	0602143A / AY6, BB7, BC3, BE8, 0602145A / BF6
02	0602720A / 048: Ind Oper Poll Ctrl Tec	0602144A / BK7
02	0602720A / 835: Mil Med Environ Crit	0602146A / AR5
02	0602720A / 896: Base Fac Environ Qual	0602146A / AR5
02	0602782A / 779: Command, Control And Platform Electronics Tech	0602146A / AV6, AW1, AQ9, AW3, AW5
02	0602782A / CY2: Applied Defensive Cyber	0602146A / AP1, AO8
02	0602782A / H92: Communications Technology	0602143A / AN1, 0602146A / AP7, AM6, AN3, AM8, AN5, AO2, AN9
02	0602783A / Y10: Computer/Info Sci Tech	0602146A / AP3
02	0602784A / 855: Topographical, Image Intel & Space	0602146A / AU5, AU3, AT7, AT9
02	0602784A / H71: Meteorological Research For Battle Command	0602146A / AV7
02	0602784A / T40: Mob/Wpns Eff Tech	0602144A / BL7, BL9, 0602145A / BF1, BG2, 0602146A / AR9, AT2, 0602150A / AE2
02	0602784A / T41: Mil Facilities Eng Tec	0602144A / BK7
02	0602784A / T42: Terrestrial Science Applied Research	0602146A / AT7
02	0602784A / T45: Energy Tec Apl Mil Fac	0602144A / BK7
02	0602786A / H98: Clothing & Equipm Tech	0602143A / AZ2, AZ9, BB4, BB5, BB9, BC2, BC6, BD6
02	0602786A / H99: Joint Service Combat Feeding Technology	0602143A / BE3
02	0602786A / XW5: Small Unit Expeditionary Maneuver Technology	0602143A / BE1, BE3, BR9
02	0602787A / 869: Warfighter Health Prot & Perf Stnds	0602787A / MK4
02	0602787A / 870: Dod Med Def Ag Inf Dis	0602787A / MM8
02	0602787A / 874: Cbt Casualty Care Tech	0602787A / MM4

02	0602787A / ET4: Appl Resch in Clinical and Rehabilitative Medicine	0602787A / MN1
02	0602787A / XV5: Medical Capabilities to Support Dispersed Ops	0602787A / MM6
03	0603001A / 242: Airdrop Equipment	0603118A / BE5
03	0603001A / C07: Joint Service Combat Feeding Tech Demo	0603118A / BE2
03	0603001A / FF6: Individual Protection	0603118A / AY9, AZ6, AZ8, BB3
03	0603001A / J50: Future Warrior Technology Integration	0603118A / BB6, BC1, BC4, BD7, BD9, BB8
03	0603001A / XW6: Small Unit Expeditionary Maneuver	0603118A / BE5
03	0603002A / 810: Ind Base Id Vacc&Drug	0603002A / MN8, MM9, MO9
03	0603002A / 840: Combat Injury Mgmt	0603002A / MO4, MN3, MO7, MN5, MM5, MO2
03	0603002A / MM3: Warfighter Medical Protection & Performance	0603002A / MN6, MO8, MN9, MO3, MN7, MG4
03	0603003A / 313: Adv Rotarywing Veh Tech	0603465A / AI4, AI6, AJ3, AJ5, AJ9, AK3, AK8, AL6 AL9, & AM3
03	0603003A / 436: Rotarywing MEP Integ	0603465A / AL1
03	0603003A / 447: ACFT Demo Engines	0603465A / AI8 & AJ1
03	0603004A / 232: Advanced Lethality & Survivability Demo	0603118A / AY7, 0603462A / BF5, BG5, BI1, BK4, BK6, 0603464A / AE6, AG3, AG5, AG7, 0603465A / AK7
03	0603004A / L96: High Energy Laser Technology Demo	0603466A / AD1
03	0603004A / L97: Smoke And Obscurants Advanced Technology	0603119A / BL3, 0603462A / BG7, BG9
03	0603005A / 221: Combat Veh Survivably	0603462A / BG7, BH1, BI1, BI5
03	0603005A / 441: Combat Vehicle Mobilty	0603119A / BK9, 0603462A / BF7, BG4, BH6, BI8, BJ1, BJ6
03	0603005A / 497: Combat Vehicle Electro	0603462A / BH8
03	0603005A / 515: Robotic Ground Systems	0603462A / BF2, BF4, BK1
03	0603006A / 592: Space Application Tech	0603463A / AO6
03	0603015A / S29: Modeling & Simulation - Adv Tech Dev	0603118A / BC8, BE9
03	0603015A / S31: Modeling And Simulation Infrastructure Technology	0603118A / BC4, BC8, BE9
03	0603125A / DF5: Agile Integration & Demonstration	0602145A / BH5, BI4
03	0603125A / DW4: Energy Technologies (Congressional Adds (CAs))	0602145A / BH5, BI4
03	0603270A / CY3: Offensive Cyber Operations Mirror Adv Tech	0603463A / AQ4
03	0603270A / K15: Advanced Comm Ecm Demo	0603463A / AN8, AO7, AO3, AO1
03	0603270A / K16: Non-Commo Ecm Tech Dem	0603465A / AK3, 0603462A / BG7, 0603463A / AO1
03	0603313A / 206: Missile Simulation	0603464A / AF4

03	0603313A / 263: Future Msl Tech Integr(FMTI)	0603464A / AE8, AE9, AH3, BS3, 0603462A / BG7
03	0603313A / 704: Advanced Missile Demo	0603466A / AC8 & AD4, 0603465A / AK5
03	0603606A / 608: Countermine & Bar Dev	0603118A / BC9, 0603462A / BJ8
03	0603606A / 683: Area Denial Sensors	0603462A / BG1
03	0603607A / 627: Jt Svc Sa Prog (JSSAP)	0603118A / AY5
03	0603710A / K70: Night Vision Adv Tech	0603118A / BC9, 0603462A / BI3, BG1, 0603463A / AQ5
03	0603710A / K86: Night Vision, Abn Sys	0603465A / AK3, AL6, AL7
03	0603728A / 002: Environmental Compliance Technology	0603119A / BK8
03	0603728A / 03E: Environmental Restoration Technology	0603119A / BM1, 0603463A / AR4, AR6
03	0603734A / T08: Combat Eng Systems	0603119A / BL6, BL8, BM1, 0603462A / BG3, 0603463A / AS9, AU6, AU4, AT8, AT3, AU1, 0603466A / AE3
03	0603772A / 101: Tactical Command and Control	0603462A / BH3, 0603463A / AW2, AW4, AR2, AV8
03	0603772A / 243: Sensors And Signals Processing	0603466A / AD6
03	0603794A / EL4: Tactical Comms and Networking Technology Int	0603463A / AP6, AP8, AM7, AP9, AN4, AN6, AO3, AQ1, AO1
03	0603794A / EL5: Secure Tactical Information Integration	0603463A / AP2, AO9
04	0603774A / VT7: Soldier Maneuver Sensors - Adv Dev	0603774A / BQ5
04	0604120A / ED5: Assured Positioning, Navigation and Timing (PNT)	1206120A / FJ8
04	0604120A / EH8: DISMOUNTED	1206120A / FJ9
04	0604120A / EH9: PSEUDOLITES	1206120A / FK1
04	0604120A / EJ2: MOUNTED	1206120A / FK2
04	0604120A / EJ3: ANTI-JAM ANTENNA	1206120A / FK3
04	0604319A / DU3: IFPC2	0605052A / EY7
05	0604710A / L67: Soldier Night Vision Devices	0604710A / BQ6
05	0604798A / FG7: Emerging Technology Initiatives	0605054A / FI3
05	0605013A / 738: AcqBiz	0605013A / FL9
05	0605053A / FB8: Soldier Borne Sensor (SBS)	0604827A / FK4
06	0604256A / 976: Army Threat Sim (ATS)	0604759A / FF1
07	0205402A / EF2: Integrated Base Defense	0604785A / DS4

Program Terminations:

<u>Budget Activity</u>	<u>OSDPE / Project</u>	<u>OSDPE Title / Project Title</u>
01	0601103A / V72	University Research Initiatives / Minerva
01	0601104A / H09	University and Industry Research Centers / Robotics CTA
01	0601104A / H50	University and Industry Research Centers / Network Sciences Cta
02	0602105A / H7G	Materials Technology / Nanomaterials Applied Research
02	0602120A / SA2	Sensors and Electronic Survivability / Biotechnology Applied Research
02	0602624A / H19	Weapons and Munitions Technology / Asymmetric & Counter Measure Technologies
02	0602705A / H17	Electronics and Electronic Devices / Flexible Display Center
02	0602720A / 895	Environmental Quality Technology / Pollution Prevention
02	0602786A / 283	Warfighter Technology / Airdrop Adv Tech
02	0602786A / VT4	Warfighter Technology / Expeditionary Mobile Base Camp Technology
03	0603001A / 543	Warfighter Advanced Technology / Ammunition Logistics
03	0603001A / VT5	Warfighter Advanced Technology / Expeditionary Mobile Base Camp Demonstration
03	0603002A / ET5	Medical Advanced Technology / Adv Tech Dev in Clinical & Rehabilitative Medicine
03	0603728A / 025	Environmental Quality Technology Demonstrations / Pollution Prevention Technology
04	0603619A / 606	Landmine Warfare and Barrier - Adv Dev / Cntrmn/Barrier Adv Dev
04	0603639A / EL8	Tank and Medium Caliber Ammunition / LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER
04	0603804A / EW8	Logistics and Engineer Equipment - Adv Dev / Armored Engineer Vehicles
04	0603804A / K39	Logistics and Engineer Equipment - Adv Dev / Field Sustainment Support Ad
04	0603804A / K41	Logistics and Engineer Equipment - Adv Dev / Water And Petroleum Distribution - Ad
04	0603804A / VR8	Logistics and Engineer Equipment - Adv Dev / Combat Service Support Systems - Ad
04	0604020A / CF1	Cross Functional Team (CFT) Advanced Development & Prototyping / CFT Advanced Development & Prototyping
04	0604115A / DS3	Technology Maturation Initiatives / Technology Maturation Initiatives
04	1206308A / FE6	Army Space Systems Integration / Army Space System Enhancement/Integration
05	0210609A / ED8	Paladin Integrated Management (PIM) / Paladin Integrated Management (PIM)
05	0604321A / B41	All Source Analysis System / CI/HUMINT Software Products (MIP)
05	0604321A / B51	All Source Analysis System / Machine - Foreign Language Translation System
05	0604601A / S62	Infantry Support Weapons / Counter-Defilade Target Engagement - SDD

05	0604601A / S70	Infantry Support Weapons / Personnel Recovery Support System (PRSS)
05	0604622A / E50	Family of Heavy Tactical Vehicles / TRAILER DEVELOPMENT
05	0604713A / EL2	Combat Feeding, Clothing, and Equipment / Army Field Feeding Equipment
05	0604741A / FG5	Air Defense Command, Control and Intelligence - Eng Dev / Counter Unmanned Aerial Systems (UAS)
05	0604768A / P01	Brilliant Anti-Armor Submunition (BAT) / MULTI - MODE SEEKER DEVELOPMENT AND TEST
05	0604780A / 571	Combined Arms Tactical Trainer (CATT) Core / Close Cbt Tact Trainer
05	0604780A / 577	Combined Arms Tactical Trainer (CATT) Core / Gaming Technology In Support Of Army Training
05	0604780A / 585	Combined Arms Tactical Trainer (CATT) Core / Aviation Combined Arms Tactical Trainer
05	0604804A / EC9	Logistics and Engineer Equipment - Eng Dev / Contingency Basing Infrastructure
05	0604804A / H01	Logistics and Engineer Equipment - Eng Dev / Combat Engineer Eq Ed
05	0604804A / H14	Logistics and Engineer Equipment - Eng Dev / Materials Handling Equipment - Ed
05	0604804A / VR7	Logistics and Engineer Equipment - Eng Dev / Combat Service Support Systems
05	0604818A / 334	Army Tactical Command & Control Hardware & Software / Common Software
05	0604823A / L87	Firefinder / Hypervelocity Armament System (HAS)
05	0604827A / EY3	Soldier Systems - Warrior Dem/Val / Soldier Power Generator
05	0605013A / FE9	Information Technology Development / ALTESS (P&R Forms)
05	0605029A / EQ2	Integrated Ground Security Surveillance Response Capability (IGSSR-C) / IntegGrdSecSurvRespC(IGSSR-C)
05	0605037A / EQ6	Evidence Collection and Detainee Processing / Evidence Collection and Detainee Processing
05	0605380A / EG6	AMF Joint Tactical Radio System (JTRS) / Small Airborne Networking Radio (SANR)
06	0303260A / FA9	Defense Military Deception Initiative / Security Initiatives
06	0604759A / 986	Major T&E Investment / Major Operational Test Instrumentation
06	0604759A / FA4	Major T&E Investment / Warrior Injury Assessment Manikin (WIAMan)
06	0605803A / 720	Technical Information Activities / Tech Info Func Actv
06	0605803A / 730	Technical Information Activities / Pers & Trng Analys Act
06	0605803A / C16	Technical Information Activities / FAST
06	0605803A / C18	Technical Information Activities / BAST
07	0203735A / 431	Combat Vehicle Improvement Programs / M113 IMPROVEMENTS
07	0203735A / FD8	Combat Vehicle Improvement Programs / Light Armored Vehicle Improvement
07	0203740A / 484	Maneuver Control System / Maneuver Control System
07	0203801A / DT5	Missile/Air Defense Product Improvement Program / Stinger Product Improvement

07	0203802A / 788	Other Missile Product Improvement Programs / ATACMS PIP
07	0205410A / EE9	Materials Handling Equipment / Material Handling Equipment - Advance Development
07	0303140A / FF8	Information Systems Security Program / Unit Activity Monitoring (UAM)
07	0303150A / EA5	WWMCCS/Global Command and Control System / Strategic and Joint Mission Command
07	0305219A / MQ1	MQ-1 Gray Eagle UAV / MQ-1 Gray Eagle - Army UAV (MIP)
07	0607135A / ES2	Apache Product Improvement Program / Apache Product Improvement Program
07	0607140A / ES7	Emerging Technologies from NIE / Emerging Technologies from NIE
07	0607665A / DT2	Family of Biometrics / 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 (ASA(ALT)) Special Programs Office.

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

12 Feb 2019

<u>Appropriation</u>	<u>FY 2018</u> <u>(Base + OCO)</u>	<u>FY 2019</u> <u>Base Enacted</u>	<u>FY 2019</u> <u>OCO Enacted</u>	<u>FY 2019</u> <u>Total Enacted</u>
Research, Development, Test & Eval, Army	11,633,461	11,074,556	300,604	11,375,160
Total Research, Development, Test & Evaluation	11,633,461	11,074,556	300,604	11,375,160

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Appropriation	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
Research, Development, Test & Eval, Army	12,192,771		204,124	204,124	12,396,895
Total Research, Development, Test & Evaluation	12,192,771		204,124	204,124	12,396,895

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<u>Summary Recap of Budget Activities</u>	<u>FY 2018</u> <u>(Base + OCO)</u>	<u>FY 2019</u> <u>Base Enacted</u>	<u>FY 2019</u> <u>OCO Enacted</u>	<u>FY 2019</u> <u>Total Enacted</u>
Basic Research	464,187	506,444		506,444
Applied Research	1,342,832	1,578,725		1,578,725
Advanced Technology Development	1,503,959	1,585,778		1,585,778
Advanced Component Development & Prototypes	1,563,615	1,264,647	4,000	1,268,647
System Development & Demonstration	3,349,488	2,965,361	236,863	3,202,224
RDT&E Management Support	1,579,102	1,438,536		1,438,536
Operational Systems Development	1,830,278	1,735,065	59,741	1,794,806
Total Research, Development, Test & Evaluation	11,633,461	11,074,556	300,604	11,375,160
 <u>Summary Recap of FYDP Programs</u>				
General Purpose Forces	668,082	666,757	10,000	676,757
Intelligence and Communications	401,118	252,771	40,613	293,384
Research and Development	10,369,821	9,830,755	249,991	10,080,746
Central Supply and Maintenance	118,410	108,696		108,696
Administration and Associated Activities	654			
Space	68,222	209,622		209,622
Classified Programs	7,154	5,955		5,955
Total Research, Development, Test & Evaluation	11,633,461	11,074,556	300,604	11,375,160

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	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
<u>Summary Recap of Budget Activities</u>					
Basic Research	454,980				454,980
Applied Research	893,990				893,990
Advanced Technology Development	1,099,564				1,099,564
Advanced Component Development & Prototypes	2,929,355		17,114	17,114	2,946,469
System Development & Demonstration	3,549,431		111,917	111,917	3,661,348
RDT&E Management Support	1,286,625		1,875	1,875	1,288,500
Operational Systems Development	1,978,826		73,218	73,218	2,052,044
Total Research; Development, Test & Evaluation	12,192,771		204,124	204,124	12,396,895
<u>Summary Recap of FYDP Programs</u>					
General Purpose Forces	866,366				866,366
Intelligence and Communications	257,681		76,418	76,418	334,099
Research and Development	10,659,601		127,706	127,706	10,787,307
Central Supply and Maintenance	59,848				59,848
Administration and Associated Activities					
Space	342,002				342,002
Classified Programs	7,273				7,273
Total Research, Development, Test & Evaluation	12,192,771		204,124	204,124	12,396,895

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<u>Summary Recap of Budget Activities</u>	<u>FY 2018</u> <u>(Base + OCO)</u>	<u>FY 2019</u> <u>Base Enacted</u>	<u>FY 2019</u> <u>OCO Enacted</u>	<u>FY 2019</u> <u>Total Enacted</u>
Basic Research	464,187	506,444		506,444
Applied Research	1,342,832	1,578,725		1,578,725
Advanced Technology Development	1,503,959	1,585,778		1,585,778
Advanced Component Development & Prototypes	1,563,615	1,264,647	4,000	1,268,647
System Development & Demonstration	3,349,488	2,965,361	236,863	3,202,224
RDT&E Management Support	1,579,102	1,438,536		1,438,536
Operational Systems Development	1,830,278	1,735,065	59,741	1,794,806
Total Research, Development, Test & Evaluation	11,633,461	11,074,556	300,604	11,375,160
<u>Summary Recap of FYDP Programs</u>				
General Purpose Forces	668,082	666,757	10,000	676,757
Intelligence and Communications	401,118	252,771	40,613	293,384
Research and Development	10,369,821	9,830,755	249,991	10,080,746
Central Supply and Maintenance	118,410	108,696		108,696
Administration and Associated Activities	654			
Space	68,222	209,622		209,622
Classified Programs	7,154	5,955		5,955
Total Research, Development, Test & Evaluation	11,633,461	11,074,556	300,604	11,375,160

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	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
<u>Summary Recap of Budget Activities</u>					
Basic Research	454,980				454,980
Applied Research	893,990				893,990
Advanced Technology Development	1,099,564				1,099,564
Advanced Component Development & Prototypes	2,929,355		17,114	17,114	2,946,469
System Development & Demonstration	3,549,431		111,917	111,917	3,661,348
RDT&E Management Support	1,286,625		1,875	1,875	1,288,500
Operational Systems Development	1,978,826		73,218	73,218	2,052,044
Total Research, Development, Test & Evaluation	12,192,771		204,124	204,124	12,396,895
<u>Summary Recap of FYDP Programs</u>					
General Purpose Forces	866,366				866,366
Intelligence and Communications	257,681		76,418	76,418	334,099
Research and Development	10,659,601		127,706	127,706	10,787,307
Central Supply and Maintenance	59,848				59,848
Administration and Associated Activities					
Space	342,002				342,002
Classified Programs	7,273				7,273
Total Research, Development, Test & Evaluation	12,192,771		204,124	204,124	12,396,895

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Se
1	0601101A	In-House Laboratory Independent Research	01	11,783	11,579		11,579	U
2	0601102A	Defense Research Sciences	01	274,098	315,660		315,660	U
3	0601103A	University Research Initiatives	01	74,349	65,202		65,202	U
4	0601104A	University and Industry Research Centers	01	103,957	114,003		114,003	U
5	0601121A	Cyber Collaborative Research Alliance	01					U
		Basic Research		464,187	506,444		506,444	
6	0602105A	Materials Technology	02	73,136	83,586		83,586	U
7	0602120A	Sensors and Electronic Survivability	02	83,581	80,849		80,849	U
8	0602122A	TRACTOR HIP	02	8,627	8,674		8,674	U
9	0602126A	TRACTOR JACK	02		400		400	U
10	0602141A	Lethality Technology	02					U
11	0602142A	Army Applied Research	02					U
12	0602143A	Soldier Lethality Technology	02					U
13	0602144A	Ground Technology	02					U
14	0602145A	Next Generation Combat Vehicle Technology	02					U
15	0602146A	Network C3I Technology	02					U
16	0602147A	Long Range Precision Fires Technology	02					U
17	0602148A	Future Verticle Lift Technology	02					U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
1	0601101A	In-House Laboratory Research	01						U
2	0601102A	Defense Research Sciences	01	297,976				297,976	U
3	0601103A	University Research Initiatives	01	65,858				65,858	U
4	0601104A	University and Industry Research Centers	01	86,164				86,164	U
5	0601121A	Cyber Collaborative Research Alliance	01	4,982				4,982	U
		Basic Research		454,980				454,980	
6	0602105A	Materials Technology	02						U
7	0602120A	Sensors and Electronic Survivability	02						U
8	0602122A	TRACTOR HIP	02						U
9	0602126A	TRACTOR JACK	02						U
10	0602141A	Lethality Technology	02	26,961				26,961	U
11	0602142A	Army Applied Research	02	25,319				25,319	U
12	0602143A	Soldier Lethality Technology	02	115,274				115,274	U
13	0602144A	Ground Technology	02	35,199				35,199	U
14	0602145A	Next Generation Combat Vehicle Technology	02	219,047				219,047	U
15	0602146A	Network C3I Technology	02	114,516				114,516	U
16	0602147A	Long Range Precision Fires Technology	02	74,327				74,327	U
17	0602148A	Future Verticle Lift Technology	02	93,601				93,601	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
18	0602150A	Air and Missile Defense Technology	02					U
19	0602211A	Aviation Technology	02	72,170	81,805		81,805	U
20	0602213A	C3I Applied Cyber	02					U
21	0602270A	Electronic Warfare Technology	02	33,683	25,558		25,558	U
22	0602303A	Missile Technology	02	52,858	91,647		91,647	U
23	0602307A	Advanced Weapons Technology	02	36,959	44,468		44,468	U
24	0602308A	Advanced Concepts and Simulation	02	27,662	28,470		28,470	U
25	0602601A	Combat Vehicle and Automotive Technology	02	78,759	104,404		104,404	U
26	0602618A	Ballistics Technology	02	83,299	85,491		85,491	U
27	0602622A	Chemical, Smoke and Equipment Defeating Technology	02	3,895	5,027		5,027	U
28	0602623A	Joint Service Small Arms Program	02	6,473	12,380		12,380	U
29	0602624A	Weapons and Munitions Technology	02	241,344	383,410		383,410	U
30	0602705A	Electronics and Electronic Devices	02	90,613	96,760		96,760	U
31	0602709A	Night Vision Technology	02	38,243	33,573		33,573	U
32	0602712A	Countermine Systems	02	25,329	27,223		27,223	U
33	0602716A	Human Factors Engineering Technology	02	23,813	24,121		24,121	U
34	0602720A	Environmental Quality Technology	02	34,118	19,469		19,469	U
35	0602782A	Command, Control, Communications Technology	02	32,458	54,956		54,956	U
36	0602783A	Computer and Software Technology	02	13,707	14,948		14,948	U

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18	0602150A	Air and Missile Defense Technology	02	50,771				50,771	U
19	0602211A	Aviation Technology	02						U
20	0602213A	C3I Applied Cyber	02	18,947				18,947	U
21	0602270A	Electronic Warfare Technology	02						U
22	0602303A	Missile Technology	02						U
23	0602307A	Advanced Weapons Technology	02						U
24	0602308A	Advanced Concepts and Simulation	02						U
25	0602601A	Combat Vehicle and Automotive Technology	02						U
26	0602618A	Ballistics Technology	02						U
27	0602622A	Chemical, Smoke and Equipment Defeating Technology	02						U
28	0602623A	Joint Service Small Arms Program	02						U
29	0602624A	Weapons and Munitions Technology	02						U
30	0602705A	Electronics and Electronic Devices	02						U
31	0602709A	Night Vision Technology	02						U
32	0602712A	Countermines Systems	02						U
33	0602716A	Human Factors Engineering Technology	02						U
34	0602720A	Environmental Quality Technology	02						U
35	0602782A	Command, Control, Communications Technology	02						U
36	0602783A	Computer and Software Technology	02						U

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37	0602784A	Military Engineering Technology	02	114,947	101,124		101,124	U
38	0602785A	Manpower/Personnel/Training Technology	02	19,791	21,847		21,847	U
39	0602786A	Warfighter Technology	02	58,476	56,532		56,532	U
40	0602787A	Medical Technology	02	88,891	92,003		92,003	U
		Applied Research		1,342,832	1,578,725		1,578,725	
41	0603001A	Warfighter Advanced Technology	03	53,763	41,795		41,795	U
42	0603002A	Medical Advanced Technology	03	103,908	101,442		101,442	U
43	0603003A	Aviation Advanced Technology	03	172,545	169,411		169,411	U
44	0603004A	Weapons and Munitions Advanced Technology	03	195,345	241,581		241,581	U
45	0603005A	Combat Vehicle and Automotive Advanced Technology	03	154,084	176,622		176,622	U
46	0603006A	Space Application Advanced Technology	03	39,277	48,985		48,985	U
47	0603007A	Manpower, Personnel and Training Advanced Technology	03	5,063	8,038		8,038	U
48	0603009A	TRACTOR HIKE	03	39,302	22,631		22,631	U
49	0603015A	Next Generation Training & Simulation Systems	03	15,778	28,650		28,650	U
50	0603117A	Army Advanced Technology Development	03					U
51	0603118A	Soldier Lethality Advanced Technology	03					U
52	0603119A	Ground Advanced Technology	03					U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se c
37	0602784A	Military Engineering Technology	02						U
38	0602785A	Manpower/Personnel/Training Technology	02	20,873				20,873	U
39	0602786A	Warfighter Technology	02						U
40	0602787A	Medical Technology	02	99,155				99,155	U
		Applied Research		893,990				893,990	
41	0603001A	Warfighter Advanced Technology	03						U
42	0603002A	Medical Advanced Technology	03	42,030				42,030	U
43	0603003A	Aviation Advanced Technology	03						U
44	0603004A	Weapons and Munitions Advanced Technology	03						U
45	0603005A	Combat Vehicle and Automotive Advanced Technology	03						U
46	0603006A	Space Application Advanced Technology	03						U
47	0603007A	Manpower, Personnel and Training Advanced Technology	03	11,038				11,038	U
48	0603009A	TRACTOR HIKE	03						U
49	0603015A	Next Generation Training & Simulation Systems	03						U
50	0603117A	Army Advanced Technology Development	03	63,338				63,338	U
51	0603118A	Soldier Lethality Advanced Technology	03	118,468				118,468	U
52	0603119A	Ground Advanced Technology	03	12,593				12,593	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Se
53	0603125A	Combating Terrorism - Technology Development	03	44,088	36,757		36,757	U
54	0603130A	TRACTOR NAIL	03	4,880	4,896		4,896	U
55	0603131A	TRACTOR EGGS	03	4,326	6,041		6,041	U
56	0603270A	Electronic Warfare Technology	03	33,249	41,458		41,458	U
57	0603313A	Missile and Rocket Advanced Technology	03	133,433	94,561		94,561	U
58	0603322A	TRACTOR CAGE	03	12,323	16,845		16,845	U
59	0603457A	C3I Cyber Advanced Development	03					U
60	0603461A	High Performance Computing Modernization Program	03	214,100	218,098		218,098	U
61	0603462A	Next Generation Combat Vehicle Advanced Technology	03					U
62	0603463A	Network C3I Advanced Technology	03					U
63	0603464A	Long Range Precision Fires Advanced Technology	03					U
64	0603465A	Future Vertical Lift Advanced Technology	03					U
65	0603466A	Air and Missile Defense Advanced Technology	03					U
66	0603606A	Landmine Warfare and Barrier Advanced Technology	03	18,473	17,097		17,097	U
67	0603607A	Joint Service Small Arms Program	03	5,628	22,799		22,799	U
68	0603710A	Night Vision Advanced Technology	03	45,617	61,313		61,313	U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
53	0603125A	Combating Terrorism - Technology Development	03						U
54	0603130A	TRACTOR NAIL	03						U
55	0603131A	TRACTOR EGGS	03						U
56	0603270A	Electronic Warfare Technology	03						U
57	0603313A	Missile and Rocket Advanced Technology	03						U
58	0603322A	TRACTOR CAGE	03						U
59	0603457A	C3I Cyber Advanced Development	03	13,769				13,769	U
60	0603461A	High Performance Computing Modernization Program	03	184,755				184,755	U
61	0603462A	Next Generation Combat Vehicle Advanced Technology	03	160,035				160,035	U
62	0603463A	Network C3I Advanced Technology	03	106,899				106,899	U
63	0603464A	Long Range Precision Fires Advanced Technology	03	174,386				174,386	U
64	0603465A	Future Vertical Lift Advanced Technology	03	151,640				151,640	U
65	0603466A	Air and Missile Defense Advanced Technology	03	60,613				60,613	U
66	0603606A	Landmine Warfare and Barrier Advanced Technology	03						U
67	0603607A	Joint Service Small Arms Program	03						U
68	0603710A	Night Vision Advanced Technology	03						U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
69	0603728A	Environmental Quality Technology Demonstrations	03	29,150	29,132		29,132	U
70	0603734A	Military Engineering Advanced Technology	03	96,586	101,438		101,438	U
71	0603772A	Advanced Tactical Computer Science and Sensor Technology	03	50,637	43,856		43,856	U
72	0603794A	C3 Advanced Technology	03	32,404	52,332		52,332	U
		Advanced Technology Development		1,503,959	1,585,778		1,585,778	
73	0603305A	Army Missile Defense Systems Integration	04	23,558	60,472		60,472	U
74	0603327A	Air and Missile Defense Systems Engineering	04	58,812	45,231	1,000	46,231	U
75	0603619A	Landmine Warfare and Barrier - Adv Dev	04	69,237	45,198		45,198	U
76	0603627A	Smoke, Obscurant and Target Defeating Sys-Adv Dev	04	8,920	20,674		20,674	U
77	0603639A	Tank and Medium Caliber Ammunition	04	45,448	41,921		41,921	U
78	0603645A	Armored System Modernization - Adv Dev	04	41,431	84,297		84,297	U
79	0603747A	Soldier Support and Survivability	04	15,759	8,735	3,000	11,735	U
80	0603766A	Tactical Electronic Surveillance System - Adv Dev	04	27,733	35,667		35,667	U
81	0603774A	Night Vision Systems Advanced Development	04	501,816	7,341		7,341	U
82	0603779A	Environmental Quality Technology - Dem/Val	04	15,039	14,731		14,731	U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
69	0603728A	Environmental Quality Technology Demonstrations	03						U
70	0603734A	Military Engineering Advanced Technology	03						U
71	0603772A	Advanced Tactical Computer Science and Sensor Technology	03						U
72	0603794A	C3 Advanced Technology	03						U
		Advanced Technology Development		1,099,564				1,099,564	
73	0603305A	Army Missile Defense Systems Integration	04	10,987				10,987	U
74	0603327A	Air and Missile Defense Systems Engineering	04	15,148		500	500	15,648	U
75	0603619A	Landmine Warfare and Barrier - Adv Dev	04	92,915				92,915	U
76	0603627A	Smoke, Obscurant and Target Defeating Sys-Adv Dev	04						U
77	0603639A	Tank and Medium Caliber Ammunition	04	82,146				82,146	U
78	0603645A	Armored System Modernization - Adv Dev	04	157,656				157,656	U
79	0603747A	Soldier Support and Survivability	04	6,514		3,000	3,000	9,514	U
80	0603766A	Tactical Electronic Surveillance System - Adv Dev	04	34,890				34,890	U
81	0603774A	Night Vision Systems Advanced Development	04	251,011				251,011	U
82	0603779A	Environmental Quality Technology - Dem/Val	04	15,132				15,132	U

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83	0603790A	NATO Research and Development	04	2,485	3,682		3,682	U
84	0603801A	Aviation - Adv Dev	04	9,653	86,180		86,180	U
85	0603804A	Logistics and Engineer Equipment - Adv Dev	04	29,619	17,230		17,230	U
86	0603807A	Medical Systems - Adv Dev	04	36,279	39,244		39,244	U
87	0603827A	Soldier Systems - Advanced Development	04	60,774	31,022		31,022	U
88	0604017A	Robotics Development	04	38,051	74,368		74,368	U
89	0604020A	Cross Functional Team (CFT) Advanced Development & Prototyping	04		9,488		9,488	U
90	0604021A	Electronic Warfare Technology Maturation (MIP)	04					U
91	0604100A	Analysis Of Alternatives	04	7,307	9,753		9,753	U
92	0604113A	Future Tactical Unmanned Aircraft System (FTUAS)	04		12,393		12,393	U
93	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor	04	57,437	89,248		89,248	U
94	0604115A	Technology Maturation Initiatives	04	145,618	95,229		95,229	U
95	0604117A	Maneuver - Short Range Air Defense (M-SHORAD)	04	19,201	79,016		79,016	U
96	0604118A	TRACTOR BEAM	04	10,400	52,894		52,894	U
97	0604119A	Army Advanced Component Development & Prototyping	04					U
98	0604120A	Assured Positioning, Navigation and Timing (PNT)	04	132,810				U

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83	0603790A	NATO Research and Development	04	5,406				5,406	U
84	0603801A	Aviation - Adv Dev	04	459,290				459,290	U
85	0603804A	Logistics and Engineer Equipment - Adv Dev	04	6,254		1,085	1,085	7,339	U
86	0603807A	Medical Systems - Adv Dev	04	31,175				31,175	U
87	0603827A	Soldier Systems - Advanced Development	04	22,113				22,113	U
88	0604017A	Robotics Development	04	115,222				115,222	U
89	0604020A	Cross Functional Team (CFT) Advanced Development & Prototyping	04						U
90	0604021A	Electronic Warfare Technology Maturation (MIP)	04	18,043				18,043	U
91	0604100A	Analysis Of Alternatives	04	10,023				10,023	U
92	0604113A	Future Tactical Unmanned Aircraft System (FTUAS)	04	40,745				40,745	U
93	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor	04	427,772				427,772	U
94	0604115A	Technology Maturation Initiatives	04	196,676				196,676	U
95	0604117A	Maneuver - Short Range Air Defense (M-SHORAD)	04	33,100		6,000	6,000	39,100	U
96	0604118A	TRACTOR BEAM	04						U
97	0604119A	Army Advanced Component Development & Prototyping	04	115,116		4,529	4,529	119,645	U
98	0604120A	Assured Positioning, Navigation and Timing (PNT)	04						U

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99	0604121A	Synthetic Training Environment Refinement & Prototyping	04	109,165	39,890		39,890	U
100	0604182A	Hypersonics	04					U
101	0604319A	Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)	04	10,871	40,979		40,979	U
102	0604403A	Future Interceptor	04					U
103	0604541A	Unified Network Transport	04					U
104	0604644A	Mobile Medium Range Missile	04					U
105	0604785A	Integrated Base Defense (Budget Activity 4)	04					U
106	0305251A	Cyberspace Operations Forces and Force Support	04	56,071	52,817		52,817	U
107	1206120A	Assured Positioning, Navigation and Timing (PNT)	04		128,640		128,640	U
108	1206308A	Army Space Systems Integration	04	30,121	38,307		38,307	U
		Advanced Component Development & Prototypes		1,563,615	1,264,647	4,000	1,268,647	
109	0604201A	Aircraft Avionics	05	30,812	32,253		32,253	U
110	0604270A	Electronic Warfare Development	05	68,935	58,627		58,627	U
111	0604321A	All Source Analysis System	05	4,774				U
112	0604328A	TRACTOR CAGE	05	30,252	17,050	12,000	29,050	U
113	0604601A	Infantry Support Weapons	05	99,145	63,793		63,793	U
114	0604604A	Medium Tactical Vehicles	05	5,798	3,699		3,699	U
115	0604611A	JAVELIN	05	20,252	5,616		5,616	U

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99	0604121A	Synthetic Training Environment Refinement & Prototyping	04	136,761				136,761	U
100	0604182A	Hypersonics	04	228,000				228,000	U
101	0604319A	Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)	04						U
102	0604403A	Future Interceptor	04	8,000				8,000	U
103	0604541A	Unified Network Transport	04	39,600				39,600	U
104	0604644A	Mobile Medium Range Missile	04	20,000				20,000	U
105	0604785A	Integrated Base Defense (Budget Activity 4)	04			2,000	2,000	2,000	U
106	0305251A	Cyberspace Operations Forces and Force Support	04	52,102				52,102	U
107	1206120A	Assured Positioning, Navigation and Timing (PNT)	04	192,562				192,562	U
108	1206308A	Army Space Systems Integration	04	104,996				104,996	U
		Advanced Component Development & Prototypes		2,929,355		17,114	17,114	2,946,469	
109	0604201A	Aircraft Avionics	05	29,164				29,164	U
110	0604270A	Electronic Warfare Development	05	70,539				70,539	U
111	0604321A	All Source Analysis System	05						U
112	0604328A	TRACTOR CAGE	05						U
113	0604601A	Infantry Support Weapons	05	106,121				106,121	U
114	0604604A	Medium Tactical Vehicles	05	2,152				2,152	U
115	0604611A	JAVELIN	05	17,897				17,897	U

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116	0604622A	Family of Heavy Tactical Vehicles	05	10,086	11,935		11,935	U
117	0604633A	Air Traffic Control	05	3,433	12,332		12,332	U
118	0604642A	Light Tactical Wheeled Vehicles	05	3,619	1,276		1,276	U
119	0604645A	Armored Systems Modernization (ASM) - Eng Dev	05	34,794	373,337		373,337	U
120	0604710A	Night Vision Systems - Eng Dev	05	184,389	144,442		144,442	U
121	0604713A	Combat Feeding, Clothing, and Equipment	05	8,561	4,502		4,502	U
122	0604715A	Non-System Training Devices - Eng Dev	05	51,900	44,381		44,381	U
123	0604741A	Air Defense Command, Control and Intelligence - Eng Dev	05	190,385	93,073	119,300	212,373	U
124	0604742A	Constructive Simulation Systems Development	05	17,921	22,600		22,600	U
125	0604746A	Automatic Test Equipment Development	05	7,054	11,782		11,782	U
126	0604760A	Distributive Interactive Simulations (DIS) - Eng Dev	05	10,890	9,134		9,134	U
127	0604768A	Brilliant Anti-Armor Submunition (BAT)	05	7,886	6,886		6,886	U
128	0604780A	Combined Arms Tactical Trainer (CATT) Core	05	17,855	21,936		21,936	U
129	0604798A	Brigade Analysis, Integration and Evaluation	05	139,386	49,250		49,250	U
130	0604802A	Weapons and Munitions - Eng Dev	05	144,389	172,744		172,744	U

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116	0604622A	Family of Heavy Tactical Vehicles	05	16,745			16,745	16,745	U
117	0604633A	Air Traffic Control	05	6,989			6,989	6,989	U
118	0604642A	Light Tactical Wheeled Vehicles	05	10,465			10,465	10,465	U
119	0604645A	Armored Systems Modernization (ASM) - Eng Dev	05	310,152			310,152	310,152	U
120	0604710A	Night Vision Systems - Eng Dev	05	181,732			181,732	181,732	U
121	0604713A	Combat Feeding, Clothing, and Equipment	05	2,393			2,393	2,393	U
122	0604715A	Non-System Training Devices - Eng Dev	05	27,412			27,412	27,412	U
123	0604741A	Air Defense Command, Control and Intelligence - Eng Dev	05	43,502			43,502	43,502	U
124	0604742A	Constructive Simulation Systems Development	05	11,636			11,636	11,636	U
125	0604746A	Automatic Test Equipment Development	05	10,915			10,915	10,915	U
126	0604760A	Distributive Interactive Simulations (DIS) - Eng Dev	05	7,801			7,801	7,801	U
127	0604768A	Brilliant Anti-Armor Submunition (BAT)	05	25,000			25,000	25,000	U
128	0604780A	Combined Arms Tactical Trainer (CATT) Core	05	9,241			9,241	9,241	U
129	0604798A	Brigade Analysis, Integration and Evaluation	05	42,634			42,634	42,634	U
130	0604802A	Weapons and Munitions - Eng Dev	05	181,023			181,023	181,023	U

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131	0604804A	Logistics and Engineer Equipment - Eng Dev	05	76,030	76,388		76,388	U
132	0604805A	Command, Control, Communications Systems - Eng Dev	05	9,559	15,950		15,950	U
133	0604807A	Medical Materiel/Medical Biological Defense Equipment - Eng Dev	05	36,685	44,495		44,495	U
134	0604808A	Landmine Warfare/Barrier - Eng Dev	05	26,188	43,064		43,064	U
135	0604818A	Army Tactical Command & Control Hardware & Software	05	157,852	169,607		169,607	U
136	0604820A	Radar Development	05	31,651	39,289		39,289	U
137	0604822A	General Fund Enterprise Business System (GFEBs)	05	47,575	36,810		36,810	U
138	0604823A	Firefinder	05	43,762	27,439		27,439	U
139	0604827A	Soldier Systems - Warrior Dem/Val	05	15,490	10,382		10,382	U
140	0604852A	Suite of Survivability Enhancement Systems - EMD	05	90,187	52,839		52,839	U
141	0604854A	Artillery Systems - EMD	05	3,892	1,779		1,779	U
142	0605013A	Information Technology Development	05	62,613	77,686		77,686	U
143	0605018A	Integrated Personnel and Pay System-Army (IPPS-A)	05	188,637	164,899		164,899	U
144	0605028A	Armored Multi-Purpose Vehicle (AMPV)	05	184,300	111,821		111,821	U
145	0605029A	Integrated Ground Security Surveillance Response Capability (IGSSR-C)	05	4,241	3,207		3,207	U
146	0605030A	Joint Tactical Network Center (JTNC)	05	15,242	15,869		15,869	U

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131	0604804A	Logistics and Engineer Equipment - Eng Dev	05	103,226				103,226	U
132	0604805A	Command, Control, Communications Systems - Eng Dev	05	12,595				12,595	U
133	0604807A	Medical Materiel/Medical Biological Defense Equipment - Eng Dev	05	48,264				48,264	U
134	0604808A	Landmine Warfare/Barrier - Eng Dev	05	39,208				39,208	U
135	0604818A	Army Tactical Command & Control Hardware & Software	05	140,637				140,637	U
136	0604820A	Radar Development	05	105,243				105,243	U
137	0604822A	General Fund Enterprise Business System (GFEBs)	05	46,683				46,683	U
138	0604823A	Firefinder	05	17,294				17,294	U
139	0604827A	Soldier Systems - Warrior Dem/Val	05	5,803				5,803	U
140	0604852A	Suite of Survivability Enhancement Systems - EMD	05	98,698				98,698	U
141	0604854A	Artillery Systems - EMD	05	15,832				15,832	U
142	0605013A	Information Technology Development	05	126,537				126,537	U
143	0605018A	Integrated Personnel and Pay System-Army (IPPS-A)	05	142,773				142,773	U
144	0605028A	Armored Multi-Purpose Vehicle (AMPV)	05	96,730				96,730	U
145	0605029A	Integrated Ground Security Surveillance Response Capability (IGSSR-C)	05	6,699				6,699	U
146	0605030A	Joint Tactical Network Center (JTNC)	05	15,882				15,882	U

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147	0605031A	Joint Tactical Network (JTN)	05	46,051	41,920		41,920	U
148	0605032A	TRACTOR TIRE	05	118,570	41,166	66,760	107,926	U
149	0605033A	Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)	05	20,661	5,169		5,169	U
150	0605034A	Tactical Security System (TSS)	05	3,998	4,490		4,490	U
151	0605035A	Common Infrared Countermeasures (CIRCM)	05	97,746	31,139	2,670	33,809	U
152	0605036A	Combating Weapons of Mass Destruction (CWMD)	05	6,650	11,297		11,297	U
153	0605037A	Evidence Collection and Detainee Processing	05	206				U
154	0605038A	Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) Sensor Suite	05	15,481	15,135		15,135	U
155	0605041A	Defensive CYBER Tool Development	05	41,441	33,796		33,796	U
156	0605042A	Tactical Network Radio Systems (Low-Tier)	05	8,845	3,825		3,825	U
157	0605047A	Contract Writing System	05	19,574	41,876		41,876	U
158	0605049A	Missile Warning System Modernization (MWSM)	05	12,480	8,266		8,266	U
159	0605051A	Aircraft Survivability Development	05	169,752	21,938	34,933	56,871	U
160	0605052A	Indirect Fire Protection Capability Inc 2 - Block 1	05	156,361	132,283		132,283	U
161	0605053A	Ground Robotics	05	60,530	71,435		71,435	U

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147	0605031A	Joint Tactical Network (JTN)	05	40,808				40,808	U
148	0605032A	TRACTOR TIRE	05						U
149	0605033A	Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)	05	3,847				3,847	U
150	0605034A	Tactical Security System (TSS)	05	6,928				6,928	U
151	0605035A	Common Infrared Countermeasures (CIRCM)	05	34,488		11,770	11,770	46,258	U
152	0605036A	Combating Weapons of Mass Destruction (CWMD)	05	10,000				10,000	U
153	0605037A	Evidence Collection and Detainee Processing	05						U
154	0605038A	Nuclear Biological Chemical Reconnaissance Vehicle (NBCRV) Sensor Suite	05	6,054				6,054	U
155	0605041A	Defensive CYBER Tool Development	05	62,262				62,262	U
156	0605042A	Tactical Network Radio Systems (Low-Tier)	05	35,654				35,654	U
157	0605047A	Contract Writing System	05	19,682				19,682	U
158	0605049A	Missile Warning System Modernization (MWSM)	05	1,539				1,539	U
159	0605051A	Aircraft Survivability Development	05	64,557		77,420	77,420	141,977	U
160	0605052A	Indirect Fire Protection Capability Inc 2 - Block 1	05	243,228				243,228	U
161	0605053A	Ground Robotics	05	41,308				41,308	U

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162	0605054A	Emerging Technology Initiatives	05		42,813		42,813	U
163	0605203A	Army System Development & Demonstration	05					U
164	0605380A	AMF Joint Tactical Radio System (JTRS)	05	18,639	15,964		15,964	U
165	0605450A	Joint Air-to-Ground Missile (JAGM)	05	28,539	11,758		11,758	U
166	0605457A	Army Integrated Air and Missile Defense (AIAMD)	05	339,051	322,263		322,263	U
167	0605625A	Manned Ground Vehicle	05					U
168	0605766A	National Capabilities Integration (MIP)	05	9,382	12,340		12,340	U
169	0605812A	Joint Light Tactical Vehicle (JLTV) Engineering and Manufacturing Development Ph	05	22,530				U
170	0605830A	Aviation Ground Support Equipment	05	6,653	7,703		7,703	U
171	0210609A	Paladin Integrated Management (PIM)	05	5,868				U
172	0303032A	TROJAN - RH12	05	5,631	4,521	1,200	5,721	U
173	0303267A	Auctioned Spectrum Relocation Fund	05	15,885				U
174	0304270A	Electronic Warfare Development	05	14,616	8,922		8,922	U
175	1205117A	Tractor Bears	05	17,928	23,170		23,170	U
		System Development & Demonstration		3,349,488	2,965,361	236,863	3,202,224	
176	0604256A	Threat Simulator Development	06	31,401	47,322		47,322	U
177	0604258A	Target Systems Development	06	13,467	32,120		32,120	U

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162	0605054A	Emerging Technology Initiatives	05	45,896				45,896	U
163	0605203A	Army System Development & Demonstration	05	164,883		19,527	19,527	184,410	U
164	0605380A	AMF Joint Tactical Radio System (JTRS)	05						U
165	0605450A	Joint Air-to-Ground Missile (JAGM)	05	9,500				9,500	U
166	0605457A	Army Integrated Air and Missile Defense (AIAMD)	05	208,938				208,938	U
167	0605625A	Manned Ground Vehicle	05	378,400				378,400	U
168	0605766A	National Capabilities Integration (MIP)	05	7,835				7,835	U
169	0605812A	Joint Light Tactical Vehicle (JLTV) Engineering and Manufacturing Development Ph	05	2,732				2,732	U
170	0605830A	Aviation Ground Support Equipment	05	1,664				1,664	U
171	0210609A	Paladin Integrated Management (PIM)	05						U
172	0303032A	TROJAN - RH12	05	3,936				3,936	U
173	0303267A	Auctioned Spectrum Relocation Fund	05						U
174	0304270A	Electronic Warfare Development	05	19,675		3,200	3,200	22,875	U
175	1205117A	Tractor Bears	05						U
		System Development & Demonstration		3,549,431		111,917	111,917	3,661,348	
176	0604256A	Threat Simulator Development	06	14,117				14,117	U
177	0604258A	Target Systems Development	06	8,327				8,327	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
178	0604759A	Major T&E Investment	06	113,516	82,893		82,893	U
179	0605103A	Rand Arroyo Center	06	19,336	19,796		19,796	U
180	0605301A	Army Kwajalein Atoll	06	234,010	246,275		246,275	U
181	0605326A	Concepts Experimentation Program	06	28,701	30,394		30,394	U
182	0605502A	Small Business Innovative Research	06	284,080				U
183	0605601A	Army Test Ranges and Facilities	06	313,589	315,634		315,634	U
184	0605602A	Army Technical Test Instrumentation and Targets	06	57,395	84,805		84,805	U
185	0605604A	Survivability/Lethality Analysis	06	41,296	40,480		40,480	U
186	0605606A	Aircraft Certification	06	4,612	3,936		3,936	U
187	0605702A	Meteorological Support to RDT&E Activities	06	7,070	9,759		9,759	U
188	0605706A	Materiel Systems Analysis	06	21,694	21,223		21,223	U
189	0605709A	Exploitation of Foreign Items	06	12,684	13,026		13,026	U
190	0605712A	Support of Operational Testing	06	50,723	52,705		52,705	U
191	0605716A	Army Evaluation Center	06	56,003	57,039		57,039	U
192	0605718A	Army Modeling & Sim X-Cmd Collaboration & Integ	06	1,756	2,798		2,798	U
193	0605801A	Programwide Activities	06	54,383	60,921		60,921	U
194	0605803A	Technical Information Activities	06	39,613	29,024		29,024	U
195	0605805A	Munitions Standardization, Effectiveness and Safety	06	65,709	72,279		72,279	U

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178	0604759A	Major T&E Investment	06	136,565			136,565	U	
179	0605103A	Rand Arroyo Center	06	13,113			13,113	U	
180	0605301A	Army Kwajalein Atoll	06	238,691			238,691	U	
181	0605326A	Concepts Experimentation Program	06	42,922			42,922	U	
182	0605502A	Small Business Innovative Research	06					U	
183	0605601A	Army Test Ranges and Facilities	06	334,468			334,468	U	
184	0605602A	Army Technical Test Instrumentation and Targets	06	46,974			46,974	U	
185	0605604A	Survivability/Lethality Analysis	06	35,075			35,075	U	
186	0605606A	Aircraft Certification	06	3,461			3,461	U	
187	0605702A	Meteorological Support to RDT&E Activities	06	6,233			6,233	U	
188	0605706A	Materiel Systems Analysis	06	21,342			21,342	U	
189	0605709A	Exploitation of Foreign Items	06	11,168			11,168	U	
190	0605712A	Support of Operational Testing	06	52,723			52,723	U	
191	0605716A	Army Evaluation Center	06	60,815			60,815	U	
192	0605718A	Army Modeling & Sim X-Cmd Collaboration & Integ	06	2,527			2,527	U	
193	0605801A	Programwide Activities	06	58,175			58,175	U	
194	0605803A	Technical Information Activities	06	25,060			25,060	U	
195	0605805A	Munitions Standardization, Effectiveness and Safety	06	44,458			44,458	U	

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196	0605857A	Environmental Quality Technology Mgmt Support	06	4,883	3,211		3,211	U
197	0605898A	Army Direct Report Headquarters - R&D - MHA	06	54,177	54,130		54,130	U
198	0606001A	Military Ground-Based CREW Technology	06	7,600	4,890		4,890	U
199	0606002A	Ronald Reagan Ballistic Missile Defense Test Site	06	59,042	62,940		62,940	U
200	0606003A	CounterIntel and Human Intel Modernization	06		2,636		2,636	U
201	0606942A	Assessments and Evaluations Cyber Vulnerabilities	06		88,300		88,300	U
202	0303260A	Defense Military Deception Initiative	06	1,708				U
203	0909999A	Financing for Cancelled Account Adjustments	06	654				U
		RDT&E Management Support		1,579,102	1,438,536		1,438,536	
204	0603778A	MLRS Product Improvement Program	07	10,286	6,877		6,877	U
205	0603813A	TRACTOR PULL	07	4,014	4,067		4,067	U
206	0605024A	Anti-Tamper Technology Support	07	4,009	7,251		7,251	U
207	0607131A	Weapons and Munitions Product Improvement Programs	07	16,302	16,003	2,548	18,551	U
208	0607133A	TRACTOR SMOKE	07	12,143	4,577	7,780	12,357	U
209	0607134A	Long Range Precision Fires (LRPF)	07	80,690	159,278		159,278	U
210	0607135A	Apache Product Improvement Program	07	55,565	24,019		24,019	U

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196	0605857A	Environmental Quality Technology Mgmt Support	06	4,681				4,681	U
197	0605898A	Army Direct Report Headquarters - R&D - MHA	06	53,820				53,820	U
198	0606001A	Military Ground-Based CREW Technology	06	4,291				4,291	U
199	0606002A	Ronald Reagan Ballistic Missile Defense Test Site	06	62,069				62,069	U
200	0606003A	CounterIntel and Human Intel Modernization	06	1,050		1,875	1,875	2,925	U
201	0606942A	Assessments and Evaluations Cyber Vulnerabilities	06	4,500				4,500	U
202	0303260A	Defense Military Deception Initiative	06						U
203	0909999A	Financing for Cancelled Account Adjustments	06						U
	RDT&E	Management Support		1,286,625		1,875	1,875	1,288,500	
204	0603778A	MLRS Product Improvement Program	07	22,877				22,877	U
205	0603813A	TRACTOR PULL	07						U
206	0605024A	Anti-Tamper Technology Support	07	8,491				8,491	U
207	0607131A	Weapons and Munitions Product Improvement Programs	07	15,645				15,645	U
208	0607133A	TRACTOR SMOKE	07						U
209	0607134A	Long Range Precision Fires (LRPF)	07	164,182				164,182	U
210	0607135A	Apache Product Improvement Program	07						U

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211	0607136A	Blackhawk Product Improvement Program	07	48,241	35,196		35,196	U
212	0607137A	Chinook Product Improvement Program	07	155,433	144,722		144,722	U
213	0607138A	Fixed Wing Product Improvement Program	07	7,782	2,280		2,280	U
214	0607139A	Improved Turbine Engine Program	07	167,532	188,903		188,903	U
215	0607140A	Emerging Technologies from NIE	07	26,112				U
216	0607142A	Aviation Rocket System Product Improvement and Development	07	9,662	38,452		38,452	U
217	0607143A	Unmanned Aircraft System Universal Products	07	36,926	38,331		38,331	U
218	0607145A	Apache Future Development	07					U
219	0607312A	Army Operational Systems Development	07					U
220	0607665A	Family of Biometrics	07	3,032	2,397		2,397	U
221	0607865A	Patriot Product Improvement	07	77,391	75,288		75,288	U
222	0203728A	Joint Automated Deep Operation Coordination System (JADOCS)	07	32,256	30,915		30,915	U
223	0203735A	Combat Vehicle Improvement Programs	07	293,921	336,063		336,063	U
224	0203740A	Maneuver Control System	07	6,443				U
225	0203743A	155mm Self-Propelled Howitzer Improvements	07	39,154	37,155		37,155	U
226	0203744A	Aircraft Modifications/Product Improvement Programs	07	34,228	17,684		17,684	U

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211	0607136A	Blackhawk Product Improvement Program	07	13,039				13,039	U
212	0607137A	Chinook Product Improvement Program	07	174,371				174,371	U
213	0607138A	Fixed Wing Product Improvement Program	07	4,545				4,545	U
214	0607139A	Improved Turbine Engine Program	07	206,434				206,434	U
215	0607140A	Emerging Technologies from NIE	07						U
216	0607142A	Aviation Rocket System Product Improvement and Development	07	24,221				24,221	U
217	0607143A	Unmanned Aircraft System Universal Products	07	32,016				32,016	U
218	0607145A	Apache Future Development	07	5,448				5,448	U
219	0607312A	Army Operational Systems Development	07	49,526				49,526	U
220	0607665A	Family of Biometrics	07	1,702				1,702	U
221	0607865A	Patriot Product Improvement	07	96,430				96,430	U
222	0203728A	Joint Automated Deep Operation Coordination System (JADOCs)	07	47,398				47,398	U
223	0203735A	Combat Vehicle Improvement Programs	07	334,463				334,463	U
224	0203740A	Maneuver Control System	07						U
225	0203743A	155mm Self-Propelled Howitzer Improvements	07	214,246				214,246	U
226	0203744A	Aircraft Modifications/Product Improvement Programs	07	16,486				16,486	U

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227	0203752A	Aircraft Engine Component Improvement Program	07	139	146		146	U
228	0203758A	Digitization	07	4,611	6,308		6,308	U
229	0203801A	Missile/Air Defense Product Improvement Program	07	43,615	1,641	2,000	3,641	U
230	0203802A	Other Missile Product Improvement Programs	07	4,800	4,941		4,941	U
231	0203808A	TRACTOR CARD	07	37,883	34,050		34,050	U
232	0205402A	Integrated Base Defense - Operational System Dev	07			8,000	8,000	U
233	0205410A	Materials Handling Equipment	07	1,519	1,462		1,462	U
234	0205412A	Environmental Quality Technology - Operational System Dev	07	187	249		249	U
235	0205456A	Lower Tier Air and Missile Defense (AMD) System	07	69,558	77,188		77,188	U
236	0205778A	Guided Multiple-Launch Rocket System (GMLRS)	07	93,900	118,955		118,955	U
238	0303028A	Security and Intelligence Activities	07	35,652	12,277	23,199	35,476	U
239	0303140A	Information Systems Security Program	07	108,755	42,520		42,520	U
240	0303141A	Global Combat Support System	07	45,372	53,855		53,855	U
241	0303150A	WWMCCS/Global Command and Control System	07	10,055	2,031		2,031	U
244	0305172A	Combined Advanced Applications	07	1,100	1,500		1,500	U
245	0305179A	Integrated Broadcast Service (IBS)	07		450		450	U

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227	0203752A	Aircraft Engine Component Improvement Program	07	144				144	U
228	0203758A	Digitization	07	5,270				5,270	U
229	0203801A	Missile/Air Defense Product Improvement Program	07	1,287				1,287	U
230	0203802A	Other Missile Product Improvement Programs	07						U
231	0203808A	TRACTOR CARD	07						U
232	0205402A	Integrated Base Defense - Operational System Dev	07						U
233	0205410A	Materials Handling Equipment	07						U
234	0205412A	Environmental Quality Technology - Operational System Dev	07	732				732	U
235	0205456A	Lower Tier Air and Missile Defense (AMD) System	07	107,746				107,746	U
236	0205778A	Guided Multiple-Launch Rocket System (GMLRS)	07	138,594				138,594	U
238	0303028A	Security and Intelligence Activities	07	13,845		22,904	22,904	36,749	U
239	0303140A	Information Systems Security Program	07	29,185				29,185	U
240	0303141A	Global Combat Support System	07	68,976				68,976	U
241	0303150A	WWMCCS/Global Command and Control System	07	2,073				2,073	U
244	0305172A	Combined Advanced Applications	07						U
245	0305179A	Integrated Broadcast Service (IBS)	07	459				459	U

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246	0305204A	Tactical Unmanned Aerial Vehicles	07	16,925	6,000		6,000	U
247	0305206A	Airborne Reconnaissance Systems	07	20,080	12,416	14,000	26,416	U
248	0305208A	Distributed Common Ground/Surface Systems	07	24,700	27,109		27,109	U
249	0305219A	MQ-1C Gray Eagle UAS	07	10,531				U
250	0305232A	RQ-11 UAV	07	12,691	6,180		6,180	U
251	0305233A	RQ-7 UAV	07	12,773	17,863		17,863	U
252	0307665A	Biometrics Enabled Intelligence	07	8,573	4,310	2,214	6,524	U
253	0708045A	End Item Industrial Preparedness Activities	07	118,410	108,696		108,696	U
254	1203142A	SATCOM Ground Environment (SPACE)	07	9,945	12,105		12,105	U
255	1208053A	Joint Tactical Ground System	07	10,228	7,400		7,400	U
9999	9999999999	Classified Programs		7,154	5,955		5,955	U
		Operational Systems Development		1,830,278	1,735,065	59,741	1,794,806	
Total Research, Development, Test & Eval, Army				11,633,461	11,074,556	300,604	11,375,160	

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246	0305204A	Tactical Unmanned Aerial Vehicles	07	5,097		34,100	34,100	39,197	U
247	0305206A	Airborne Reconnaissance Systems	07	11,177		14,000	14,000	25,177	U
248	0305208A	Distributed Common Ground/Surface Systems	07	38,121				38,121	U
249	0305219A	MQ-1C Gray Eagle UAS	07						U
250	0305232A	RQ-11 UAV	07	3,218				3,218	U
251	0305233A	RQ-7 UAV	07	7,817				7,817	U
252	0307665A	Biometrics Enabled Intelligence	07	2,000		2,214	2,214	4,214	U
253	0708045A	End Item Industrial Preparedness Activities	07	59,848				59,848	U
254	1203142A	SATCOM Ground Environment (SPACE)	07	34,169				34,169	U
255	1208053A	Joint Tactical Ground System	07	10,275				10,275	U
9999	9999999999	Classified Programs		7,273				7,273	U
		Operational Systems Development		1,978,826		73,218	73,218	2,052,044	
Total Research, Development, Test & Eval, Army				12,192,771		204,124	204,124	12,396,895	

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93	04	0604114A	Lower Tier Air Missile Defense (LTAMD) Sensor.....	453
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Soldier Systems - Advanced Development	0603827A	87	04.....	352
Synthetic Training Environment Refinement & Prototyping	0604121A	99	04.....	566
TRACTOR BEAM	0604118A	96	04.....	529
Tactical Electronic Surveillance System - Adv Dev	0603766A	80	04.....	193
Tank and Medium Caliber Ammunition	0603639A	77	04.....	59
Technology Maturation Initiatives	0604115A	94	04.....	462
Unified Network Transport	0604541A	103	04.....	603

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603305A / <i>Army Missile Defense Systems Integration</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	23.558	60.472	10.987	-	10.987	10.947	11.575	11.614	12.232	0.000	141.385
FG6: <i>Missile Defense (CA)</i>	-	14.000	49.700	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	63.700
TR5: <i>Missile Defense Battlelab</i>	-	9.558	10.772	10.987	-	10.987	10.947	11.575	11.614	12.232	0.000	77.685

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).

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)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	9.634	10.777	11.936	-	11.936
Current President's Budget	23.558	60.472	10.987	-	10.987
Total Adjustments	13.924	49.695	-0.949	-	-0.949
• Congressional General Reductions	-0.002	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	14.000	49.700			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.074	-			
• Adjustments to Budget Years	-	-	-0.949	-	-0.949

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603305A / <i>Army Missile Defense Systems Integration</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: FG6: *Missile Defense (CA)*

Congressional Add: *Missile Defense (CA)*

Congressional Add Subtotals for Project: FG6

Congressional Add Totals for all Projects

	FY 2018	FY 2019
	14.000	49.700
Congressional Add Subtotals for Project: FG6	14.000	49.700
Congressional Add Totals for all Projects	14.000	49.700

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) FG6 / Missile Defense (CA)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FG6: <i>Missile Defense (CA)</i>	-	14.000	49.700	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	63.700
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 2018	FY 2019
Congressional Add: Missile Defense (CA)	14.000	49.700
FY 2018 Accomplishments: Missile Defense (CA)		
FY 2019 Plans: Missile Defense (CA)		
Congressional Adds Subtotals	14.000	49.700

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603305A / Army Missile Defense Systems Integration				FG6 / Missile Defense (CA)							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
High Power Microwave Lethality	SS/CPFF	Radiancance : Huntsville	3.900	-		10.000		-		-		-	0.000	13.900	-
Advanced Electronic/ Environmental Control Unit Thermal Management Prototype	SS/CPAF	Rocky Research : Huntsville	14.000	14.000		15.000		-		-		-	0.000	43.000	-
Technology Complex Compound Materials for Thermal/Energy Management Prototype	SS/CPFF	Radiancance : huntsville	2.250	-		-		-		-		-	0.000	2.250	-
Advanced Measurement Optical Range Facility Upgrades	SS/CPFF	Radiancance : 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 Range Weapons Analysis	SS/CPFF	Radiancance : Huntsville	-	-		5.000		-		-		-	0.000	5.000	-
Subtotal			26.344	14.000		49.700		-		-		-	0.000	90.044	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) FG6 / Missile Defense (CA)
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	30.000	14.000	49.700	-	-	-	0.000	93.700	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) FG6 / Missile Defense (CA)	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) FG6 / Missile Defense (CA)

Schedule Details

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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration				Project (Number/Name) TR5 / Missile Defense Battlelab			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
TR5: <i>Missile Defense Battlelab</i>	-	9.558	10.772	10.987	-	10.987	10.947	11.575	11.614	12.232	0.000	77.685
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 2018	FY 2019	FY 2020
Title: Prototypes	5.700	6.359	6.649
Description: Funding is provided for the following efforts:			
FY 2019 Plans:			
Take the lessons learned from the FY 2018 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 space, missile defense, and high altitude 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			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / <i>Army Missile Defense Systems Integration</i>	Project (Number/Name) TR5 / <i>Missile Defense Battlelab</i>

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

	FY 2018	FY 2019	FY 2020
<p>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.</p> <p>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 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. Provide Government program management and oversight for National Capital Region's Integrated Air Defense System. These funds will be executed by USASMDC / ARSTRAT, Future Warfare Center.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) TR5 / Missile Defense Battlelab

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
The increase from FY 2019 to FY 2020 is because of inflation and increased emphasis on Capability Development prototype requirements for Defense of the Homeland from missile attacks.			
<p>Title: Analysis, and Models and Simulations (M&S)</p> <p>Description: Funding is provided for the following efforts:</p> <p>FY 2019 Plans: Take the lessons learned from the FY 2018 efforts to continue to 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.</p> <p>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</p>	3.858	4.242	4.338

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) TR5 / Missile Defense Battlelab

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
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 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is because of inflation and increased emphasis on Capability Development Analysis, and Modeling and Simulation requirements for Defense of the Homeland from missile attacks.			
Title: FY2019 SBIR/STTR Transfer Description: FY2019 SBIR/STTR Transfer FY 2019 Plans: FY2019 SBIR/STTR adjustment FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 SBIR/STTR Transfer	-	0.171	-
Accomplishments/Planned Programs Subtotals	9.558	10.772	10.987

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) TR5 / Missile Defense Battlelab
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Personnel and Operations Support	C/TBD	To Be determined : To Be Determined	-	-		9.364		7.258		-		7.258	0.000	16.622	-
Subtotal			-	-		9.364		7.258		-		7.258	0.000	16.622	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Contracts	Various	To Be Determined : To Be determined	-	1.156		1.237		3.729		-		3.729	0.000	6.122	-
FY2019 SBIR/STTR Transger	TBD	TBD : TBD	-	-		0.171		-		-		-	0.000	0.171	-
Subtotal			-	1.156		1.408		3.729		-		3.729	0.000	6.293	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	130.381	8.402		-		-		-		-	Continuing	Continuing	Continuing
Subtotal			247.808	8.402		-		-		-		-	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army							Date: March 2019				
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration				Project (Number/Name) TR5 / Missile Defense Battlelab				
	Prior Years	FY 2018	FY 2019		FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals	247.808	9.558	10.772		10.987	-	10.987	Continuing	Continuing	N/A	

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / Army Missile Defense Systems Integration	Project (Number/Name) TR5 / Missile Defense Battlelab

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Experiments & technology enhancements of prototypes																												
Development of Extended Air Defense Simulation Updates																												
Reconfigurable Tactical Operations System (RTOS) Development																												
JFCC-Integrated Missile Defense Operational Analysis																												
High Energy Laser for AMD																												
Analysis Support to JIAMD																												
AN/TPY-2 FBM Transition from MDA to Army																												
Missile Defense Simulation Suppt to TRADOC ARCIC Experiments																												
Force Design Requirements Assessment for Missile Defense Force																												
Allied and Partner Modeling to Inform Integration Efforts to Meet																												
Pacific Focused-Adversary Centric Bundled																												
Inert Debris Analysis																												
Hypersonics Analysis																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603305A / <i>Army Missile Defense Systems Integration</i>	Project (Number/Name) TR5 / <i>Missile Defense Battlelab</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603327A / <i>Air and Missile Defense Systems Engineering</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	58.812	46.231	15.148	0.500	15.648	27.008	31.444	0.000	0.000	Continuing	Continuing
FG9: <i>Air and Missile Defense (AMD) Electronic Warfare</i>	-	58.812	46.231	15.148	0.500	15.648	27.008	31.444	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 Element (PE) supports Cyber and Electromagnetic Activities (CEMA) efforts to conduct operational realistic assessments of Army Air and Missile Defense (AMD) performance, identify system vulnerabilities, and develop mitigations against threats across the Cyber and Electromagnetic spectrum. Army AMD 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 AMD systems, to include other Service and other Agency AMD systems as appropriate. Upon completion of CEMA demonstration analyses, funding will facilitate initial recommendations for potential mitigations and solutions to Army AMD sensors, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army AMD systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army AMD 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 AMD sensors, C2, and RF data and voice networks in contested CEMA environments.

FY 2020 funding of \$15.648 million will be used to analyze P-12 event data, provide recommendations for rapid countermeasures and potential solutions, conduct destructive CEMA lab events, continue virtualization of additional AMD system of systems architecture for future CEMA assessments against advanced destructive cyber and electromagnetic threats. Funding will also be used to initiate planning and preparation for the P-13 event.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603327A / <i>Air and Missile Defense Systems Engineering</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	57.649	43.802	43.273	-	43.273
Current President's Budget	58.812	46.231	15.148	0.500	15.648
Total Adjustments	1.163	2.429	-28.125	0.500	-27.625
• Congressional General Reductions	-0.017	-0.031			
• Congressional Directed Reductions	-13.000	-17.540			
• Congressional Rescissions	-	-			
• Congressional Adds	15.000	20.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.820	-			
• Adjustments to Budget Years	-	-	-28.125	0.500	-27.625

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

Project: FG9: *Air and Missile Defense (AMD) Electronic Warfare*

Congressional Add: *Interoperability of integrated air and missile defense.*

	FY 2018	FY 2019
	15.000	20.000
Congressional Add Subtotals for Project: FG9	15.000	20.000
Congressional Add Totals for all Projects	15.000	20.000

Change Summary Explanation

The FY 2020 change is primarily driven by the transition of ALPS to PE 0604741 Project 126.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FG9: Air and Missile Defense (AMD) Electronic Warfare	-	58.812	46.231	15.148	0.500	15.648	27.008	31.444	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 Air and Missile Defense (AMD) performance, identify system vulnerabilities, and develop mitigations against threats across the Cyber and Electromagnetic spectrum. Army AMD 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 AMD systems, to include other Service and other Agency AMD systems as appropriate. Upon completion of CEMA demonstration analyses, funding will facilitate initial recommendations for potential mitigations and solutions to Army AMD sensors, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army AMD systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army AMD 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 AMD sensors, C2, and RF data and voice networks in contested CEMA environments.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Electronic Protection Enhancements and ALPS Development/Integration	43.812	24.743	15.148	0.500	15.648
Description: Provides Cyber and Electromagnetic Activities (CEMA) planning, conducts CEMA demonstrations and post-mission analysis, and develops/integrates Army Long-Range Persistent Surveillance (ALPS).					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
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)					
Funding is provided for continued planning and preparation and to conduct the P-12 event. Funding will also be used to continue the Cyber and Electromagnetic Activities (CEMA) roadmap and strategy that ensures coordination and execution of prioritized goals. Virtualize IAMD and PATRIOT components, validate the models, and assess them in a contested environment. Continue virtualization of additional IAMD sensors and launchers. Continue ALPS development and integration of ALPS into the Army AMD architecture.					
FY 2020 Base 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 2020 OCO Plans: Funds will be used to continue an operational assessment of ALPS prototype systems in support of a Combatant Commander identified need.					
FY 2019 to FY 2020 Increase/Decrease Statement: The funding reduction from FY 2019 to FY 2020 is driven by the transition of ALPS to PE 0604741A, Project 126.					
Title: FY 2019 SBIR/STTR Transfer					
FY 2019 Plans: FY 2019 SBIR/STTR Transfer.					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR Transfer					
Accomplishments/Planned Programs Subtotals					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
	43.812	26.231	15.148	0.500	15.648
Congressional Add: Interoperability of integrated air and missile defense.		FY 2018	FY 2019		
		15.000	20.000		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019	
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603327A / <i>Air and Missile Defense Systems Engineering</i>	Project (Number/Name) FG9 / <i>Air and Missile Defense (AMD) Electronic Warfare</i>	
		FY 2018	FY 2019
FY 2018 Accomplishments: Interoperability of integrated air and missile defense.			
FY 2019 Plans: Interoperability of integrated air and missile defense.			
Congressional Adds Subtotals		15.000	20.000

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603327A / Air and Missile Defense Systems Engineering				FG9 / Air and Missile Defense (AMD) Electronic Warfare							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Program Management	Various	Various : Various	-	2.831	Nov 2017	1.688	Nov 2018	0.949	Nov 2019	-		0.949	Continuing	Continuing	Continuing
Subtotal			-	2.831		1.688		0.949		-		0.949	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
System Integration Assessment	Various	Various : Various	-	1.538	Dec 2017	2.840	Nov 2018	2.715	Nov 2019	-		2.715	Continuing	Continuing	Continuing
ALPS Development/ Integration	Various	Various : Various	6.100	22.731	Jan 2018	7.495	Jan 2019	0.000		0.500	Jan 2020	0.500	0.000	36.826	-
Interoperability of Integrated AMD	SS/CPFF	Various : Various	-	15.000	Aug 2018	20.000	Feb 2019	-		-		-	0.000	35.000	-
FY 2019 SBIR/STTR Transfer	TBD	Army Budget Office : Pentagon, Washington, DC	-	-		1.488		-		-		-	0.000	1.488	-
Subtotal			6.100	39.269		31.823		2.715		0.500		3.215	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Component Assessments & Research and Trade Studies	Various	Various : Various	-	12.512	Feb 2018	5.850	Feb 2019	8.481	Feb 2020	-		8.481	Continuing	Continuing	Continuing
Subtotal			-	12.512		5.850		8.481		-		8.481	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Demonstration Planning and Execution	Various	Various : Various	-	4.200	Nov 2017	6.870	Nov 2018	3.003	Nov 2019	-		3.003	Continuing	Continuing	Continuing
Subtotal			-	4.200		6.870		3.003		-		3.003	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			6.100	58.812		46.231		15.148		0.500		15.648	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
P-11 Demonstration																												
P-11 Analysis Efforts, Trade Studies, and Implementation																												
P-12 Demonstration Planning Efforts																												
P-12 Demonstration																												
P-12 Analysis Efforts, Trade Studies, and Implementation																												
P-13 Demonstration Planning Efforts																												
P-13 Demonstration																												
P-13 Analysis Effort, Trade Studies, and Implementation																												
P-14 Demonstration Planning Efforts																												
Air and Missile Defense Systems Hardware Virtualization																												
ALPS Prototype Development and Integration																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603327A / <i>Air and Missile Defense Systems Engineering</i>	Project (Number/Name) FG9 / <i>Air and Missile Defense (AMD) Electronic Warfare</i>

Schedule Details

Events	Start		End	
	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
P-13 Demonstration Planning Efforts	4	2020	2	2021
P-13 Demonstration	3	2021	3	2021
P-13 Analysis Effort, Trade Studies, and Implementation	4	2021	2	2022
P-14 Demonstration Planning Efforts	1	2022	4	2022
Air and Missile Defense Systems Hardware Virtualization	2	2019	4	2022
ALPS Prototype Development and Integration	4	2017	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	69.237	45.198	92.915	-	92.915	6.963	0.000	0.000	0.000	Continuing	Continuing
606: <i>Cntrmn/Barrier Adv Dev</i>	-	3.187	2.964	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.151
BU5: <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>	-	0.000	0.000	12.983	-	12.983	6.963	0.000	0.000	0.000	0.000	19.946
EK7: <i>Area Denial Capability Development</i>	-	66.050	42.234	79.932	-	79.932	0.000	0.000	0.000	0.000	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 alternatives to the Family of Scatterable Mines systems.

Project 606 enables component development of a new detection capability for explosive hazards, improvised explosive devices (IED), and components in support of route clearance operations. These capabilities will enhance the effectiveness of the Route Clearance Platoon within the Engineer Company, the Brigade Combat Team as well as with other related Army missions.

Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an interim Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap. FY 2020 funding resources the initiation of the SAVO program. SAVO supports a U.S. Army Europe (USAREUR) Operational Needs Statement (ONS) as well as a revision to the Multiple Delivery Mine System (Volcano) Joint Service Operational Requirement (JSOR). This capability will allow for the 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 from which the existing stock of National Landmine Policy compliant munitions (M87A1 Volcano canisters) can be launched. SAVO can be initiated through an interface with three fielded systems; the M7 Spider Networked Munition System, the MK152/ M156 Remote Activation Munition Systems (RAMS), or the CD450-4J Blasting Machine.

Project EK7 Area Denial Capability Development will evaluate integrated technologies and prototype systems in a realistic operating environment to expedite technology transition for Terrain Shaping Obstacles. The obstacles will deny the enemy terrain and freedom of action while allowing friendly forces to maneuver freely within the same battle space. Area Denial Capability Development provides controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. Area Denial Capability Development enables the Combatant Commander to shape the battle space without exposing friendly forces to enemy engagement and to actively detect and engage the enemy at all operational ranges. Area Denial Capability Development will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	72.909	45.254	98.627	-	98.627
Current President's Budget	69.237	45.198	92.915	-	92.915
Total Adjustments	-3.672	-0.056	-5.712	-	-5.712
• Congressional General Reductions	-0.059	-0.056			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.797	-			
• SBIR/STTR Transfer	-2.816	-			
• Adjustments to Budget Years	-	-	-5.712	-	-5.712

Change Summary Explanation

FY 2018 Congressional General Reduction in the amount of \$0.059 million due to Section 8024 (f), Federally Funded Research and Development Center (FFRDC) reductions.

FY 2018 SBIR/STTR Transfer in the amount of -\$2.816 million breakout: Project 606 is \$0.162 million and Project EK7 is \$2.654 million.

FY 2018 Congressional Rescission of \$20M.

FY 2019 Congressional General Reduction in the amount of \$0.056 million due to Section 8024 (f), Federally Funded Research and Development Center (FFRDC) reductions.

FY 2019 SBIR/STTR Transfer in the amount of -\$1.643 million breakout: Project 606 is \$0.095 million and Project EK7 is \$1.548 million.

FY 2020 funding decrease of \$5.712 million supports the Army's modernization priorities in support of the National Defense Strategy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>				Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
606: <i>Cntrmn/Barrier Adv Dev</i>	-	3.187	2.964	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.151
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project funding was decreased to support the Army's Modernization priorities in support of the National Defense Strategy.

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.

There are no FY 2020 Base Research, Development, Test & Evaluation (RDT&E) funds requested for this project.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Husky Mounted Detection System (HMDS) Engineering and Program Management Description: Supports System Engineering and Program Management	1.435	-	-	-	-
Title: HMDS Explosive Hazard Detection Technology Development Description: Explosive Hazard Detection Technology Analysis	1.478	-	-	-	-
Title: HMDS Explosive Hazard Detection Test and Evaluation Description: Explosive Hazard Detection Test and Evaluation	0.274	-	-	-	-
Title: Forward Reconnaissance and Explosive Hazard Detection (FREHD) FY 2019 Plans:	-	2.869	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct the Milestone Decision Authority (MDA) delegation, the Materiel Development Decision (MDD), the Analysis of Alternatives (AoA) and the Milestone documentation for the initiation of Technology Maturation and Risk Reduction (TMRR)					
FY 2019 to FY 2020 Increase/Decrease Statement: In FY2020 FREHD has no funding					
Title: FY 2019 SBIR / STTR Transfer	-	0.095	-	-	-
FY 2019 Plans: SBIR / STTR Tax					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	3.187	2.964	-	-	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 415: <i>Mine Neutral/Detection</i>	12.537	33.204	17.910	-	17.910	0.727	0.645	5.000	4.630	Continuing	Continuing
• R64001: <i>HUSKY MOUNTED DETECTION SYSTEM (HMDS)</i>	16.695	35.834	83.082	34.253	117.335	152.437	67.879	-	-	0.000	390.180
• R64002: <i>HMDS - GROUND PENETRATING RADAR</i>	16.695	35.834	53.700	34.253	87.953	57.453	12.129	-	-	0.000	210.064
• R64003: <i>HMDS - DEEP BURIED DETECTION</i>	-	-	29.382	-	29.382	94.984	55.750	-	-	0.000	180.116

Remarks
PE 0604808 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 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 2018, as part Engineering Development activities, the program will execute an Engineering Change Proposal (ECP) to add a wire detection capability to address evolving threat, and Infrared illumination to enable nighttime operation. A second ECP to improve operational availability of the HMDS during inclement weather

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>
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and address obsolescence and Cyber Security deficiencies will follow. As part of the Advanced Development activities, the HMDS Program will conduct additional development and evaluation of technologies to address a broader spectrum of emerging threats, interoperability with electronic countermeasures, and detection and neutralization of landmines and Improvised Explosive Devices (IEDs) at operational speeds.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management - HMDS	MIPR	PM Terrestrial Sensors : Fort Belvoir, VA	-	0.300		-		-		-		-	0.000	0.300	-
Program Management - FREHD	Allot	PM CCS : Picatinny Arsenal, NJ	-	-		0.133	Mar 2019	-		-		-	0.000	0.133	-
Subtotal			-	0.300		0.133		-		-		-	0.000	0.433	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
HMDS To Be Determined	TBD	TBD : TBD	-	0.780		-		-		-		-	0.000	0.780	-
FY19 SBIR / STTR	TBD	TBD : TBD	-	-		0.095		-		-		-	0.000	0.095	-
Subtotal			-	0.780		0.095		-		-		-	0.000	0.875	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	-	-		2.736	Mar 2019	-		-		-	0.000	2.736	-
Subtotal			-	1.833		2.736		-		-		-	0.000	4.569	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>

Schedule Details

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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BU5: Standoff Volcano Obstacle (SAVO) Adv Tech	-	0.000	0.000	12.983	-	12.983	6.963	0.000	0.000	0.000	0.000	19.946
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2020.

A. Mission Description and Budget Item Justification

This is a new start project starting in FY 2020. Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an interim Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap. FY 2020 funding resources the initiation of the SAVO program. SAVO supports a U.S. Army Europe (USAREUR) Operational Needs Statement (ONS) as well as a revision to the Multiple Delivery Mine System (Volcano) Joint Service Operational Requirement (JSOR). This capability will allow for the 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 from which the existing stock of National Landmine Policy compliant munitions (M87A1 Volcano canisters) can be launched. SAVO can be initiated through an interface with three fielded systems; the M7 Spider Networked Munition System, the MK152/M156 Remote Activation Munition Systems (RAMS), or the CD450-4J Blasting Machine.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SAVO Rapid Prototyping	-	-	9.450	-	9.450
Description: Initiation of the SAVO system Rapid Prototyping phase.					
FY 2020 Base Plans: Performs SAVO system Rapid Prototyping phase to include; Initiation of new start effort, development of system design, conduct requirements review, development of test and evaluation hardware configurations and fabrication of prototype systems for early test and evaluation.					
FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$9.450 million as this is a new start effort.					
Title: Engineering Support	-	-	0.350	-	0.350
Description: Provide Engineering Support.					
FY 2020 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Performs OGA and contract engineering support to the Integrated Product Team supporting the Rapid Prototyping effort.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$0.350 million as this is a new start effort and there was no funding in FY 2019.</p>					
<p>Title: SAVO Management Services</p> <p>Description: Program Management and Support</p> <p>FY 2020 Base Plans: Performs program management of the SAVO program.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$1.433 million as this is a new start effort and there was no funding in FY 2019.</p>	-	-	1.433	-	1.433
<p>Title: SAVO Test & Evaluation</p> <p>Description: Provides support to Contractor/Government test activities.</p> <p>FY 2020 Base Plans: Performs test and evaluation activities such as development of test and evaluation strategy and conduction of initial testing on the prototype systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$1.750 million as this is a new start effort and there was no funding in FY 2019.</p>	-	-	1.750	-	1.750
Accomplishments/Planned Programs Subtotals	-	-	12.983	-	12.983

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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>

D. Acquisition Strategy

SAVO will utilize a Middle Tier of Acquisition for Rapid Prototyping and Fielding acquisition approach in accordance with Section 804 of the 2016 National Defense Authorization Act (NDAA). Development will utilize an Other Transaction Authority contract.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SAVO Program Management TDY and Support	MIPR	PM Close Combat Systems : Picatinny Arsenal, NJ	-	-		-		1.433	Jan 2020	-		1.433	0.000	1.433	-
Subtotal			-	-		-		1.433		-		1.433	0.000	1.433	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
DOTC Manufacture Support	C/CPIF	To Be Determined : To Be Determined	-	-		-		6.450	Nov 2019	-		6.450	0.000	6.450	-
Subtotal			-	-		-		6.450		-		6.450	0.000	6.450	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ARL HRED MANPRINT Support	MIPR	Army Research Laboratory (ARL) - HRED : Picatinny Arsenal, NJ	-	-		-		0.050	Jan 2020	-		0.050	0.000	0.050	-
Contract Test and Engineering Support	C/CPIF	To Be Determined : To Be Determined	-	-		-		0.300	Jan 2020	-		0.300	0.000	0.300	-
SAVO - ARDEC Engineering Support	TBD	ARDEC : Picatinny Arsenal, NJ	-	-		-		3.000	Jan 2020	-		3.000	0.000	3.000	-
Subtotal			-	-		-		3.350		-		3.350	0.000	3.350	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>				Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>								
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Other Government Agencies and Support Contractors	MIPR	Army Test & Evaluation Command (ATEC) : TBD	-	-		-		1.750	May 2020	-		1.750	0.000	1.750	-	
Subtotal			-	-		-		1.750		-		1.750	0.000	1.750	N/A	
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals			-	-		0.000		12.983		-		12.983	0.000	12.983	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				
	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	
Rapid Prototyping Decision Review					▲ 1																								
OTA Rapid Prototyping																													
Focus Assesment													▲ 2																
Design Review													▲ 3																
User Jury																	▲ 4												
Qualification Testing																													
Operational Assesment																	▲ 5												
SAVO Production Contract																													
Rapid Fielding Decision Review																					▲ 6								
Initial Operational Capability																									▲ 7				
Full Operational Capability																													▲ 8

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Rapid Prototyping Decision Review	3	2019	3	2019
OTA Rapid Prototyping	1	2020	4	2021
Focus Assesment	1	2020	1	2020
Design Review	1	2020	1	2020
User Jury	4	2020	4	2020
Qualification Testing	1	2021	3	2021
Operational Assesment	2	2021	2	2021
SAVO Production Contract	4	2021	3	2024
Rapid Fielding Decision Review	4	2021	4	2021
Initial Operational Capability	4	2022	4	2022
Full Operational Capability	4	2024	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EK7: Area Denial Capability Development	-	66.050	42.234	79.932	-	79.932	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides for the development of Terrain Shaping Obstacles.

Area Denial Capability Development will evaluate integrated technologies and prototype systems in a realistic operating environment to expedite technology transition for Terrain Shaping Obstacles. The obstacles will deny the enemy terrain and freedom of action while allowing friendly forces to maneuver freely within the same battlespace. Area Denial Capability Development provides controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. Area Denial Capability Development enables the Combatant Commander to shape the battle space without exposing friendly forces to enemy engagement and to actively detect and engage the enemy at all operational ranges. Area Denial Capability Development will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Area Denial Capability Development	34.230	25.583	59.976	-	59.976
Description: Develop and build system and sub-system level concepts that will be evaluated for affordability, feasibility, and technical maturity. Complete competitive development of systems and perform initiatives to mature technical feasibility and reduce risk.					
FY 2019 Plans: Will conduct analysis of munitions delivery system alternatives. Prepare for Milestone A decision to develop Terrain Shaping Obstacle munitions. Will award contract agreements to mature munitions technology and reduce program technical and cost risk.					
FY 2020 Base Plans: Conduct system level design, mature munitions technologies, mature obstacle delivery methods, integrate munitions into delivery system, mature system technology and reduce program technical and cost risk.					
FY 2019 to FY 2020 Increase/Decrease Statement: Funds were increased in FY 2020 to conduct Technology Maturation activities.					
Title: Engineering Support	10.283	12.165	12.766	-	12.766

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Description: Provide Engineering Support.</p> <p>FY 2019 Plans: Will provide engineering support to analyze munitions delivery system alternatives, achieve Milestone A decision to develop Terrain Shaping Obstacle munitions, and award contract agreements to mature munitions technology and reduce program technical and cost risk.</p> <p>FY 2020 Base Plans: Provide engineering support for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase was attributable to revised engineering support plan.</p>					
<p>Title: Program Management and Oversight</p> <p>Description: Program Management and Support</p> <p>FY 2019 Plans: Will provide Program Management support to analyze munitions delivery system alternatives, achieve Milestone A decision to develop Terrain Shaping Obstacle munitions, and award contract agreements to mature munitions technology and reduce program technical and cost risk. Will conduct industry engagements and award Technology Maturation and Risk Reduction phase contracts/agreements to develop Terrain Shaping Obstacle munitions.</p> <p>FY 2020 Base Plans: Provide program management and oversight for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts. Conduct long-range program planning, risk analysis, and program oversight.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase is attributable to assessment of PM support costs.</p>	1.537	2.738	4.890	-	4.890
<p>Title: Test & Evaluation</p> <p>Description: Provides support to Contractor/Government test activities.</p> <p>FY 2019 Plans:</p>	-	0.200	2.300	-	2.300

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop test and evaluation strategy for initial prototype systems. FY 2020 Base Plans: Support contractor lead developmental testing as needed and conduct a test to assess technology readiness for engineering and manufacturing development. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase was attributable to revised Test and Evaluation plans.					
Title: FY 2018 Congressional Rescission	20.000	-	-	-	-
Title: FY 2019 SBIR / STTR Transfer Description: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer	-	1.548	-	-	-
Accomplishments/Planned Programs Subtotals	66.050	42.234	79.932	-	79.932

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0604808A: <i>Landmine Warfare/Barrier - Eng Dev</i>	26.188	43.064	39.208	-	39.208	166.902	159.442	170.596	100.426	Continuing	Continuing

Remarks
PE 0604808A Project 434 Anti-personnel Landmine Alternatives (NSD) is the engineering and manufacturing development follow-on to this funding line, and is a shared project line. The above profile represents the total program element, not only the follow-on activities of the program.

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 awarded four concept prototype contracts/agreements to develop representative prototypes (hardware and/or models) which were used to assess the TSO concepts, technical risks, and costs of potential munitions systems and associated capabilities. The Army has awarded

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>
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two initiatives to develop representative prototypes of top attack munitions to assess concept feasibility, maturity and technical risk. The Army intends to develop the TSO munitions system and associated capabilities. The TSO system will eventually be packaged into various delivery methods for employment at all operational ranges; however, the Army plans to initially develop and field the TSO capability at close operational ranges. The Army intends to competitively award up to two Technology Maturation and Risk Reduction (TMRR) contracts/agreements in FY 2019 to develop competing prototypes of the TSO munitions and associated capabilities, which includes close-range delivery mechanisms. As the munitions system matures, the items will be available for integration into additional delivery methods for employment across the entire range of operations.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program	MIPR	PM-CCS : Picatinny Arsenal, NJ	12.004	1.537	Jul 2018	2.433	Feb 2019	1.740	Nov 2019	-		1.740	Continuing	Continuing	-
Scorpion Contract Closeout	MIPR	General Dynamics : TBD	-	-		0.305		-		-		-	0.000	0.305	-
SBIR/STTR/FFRDC	MIPR	PM CCS : Picatinny Arsenal, NJ	-	-		-		3.150	Nov 2019	-		3.150	Continuing	Continuing	-
FY 2018 Congressional Rescission	TBD	TBD : TBD	-	20.000		-		-		-		-	0.000	20.000	-
Subtotal			12.004	21.537		2.738		4.890		-		4.890	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Prototype Development D	SS/CPFF	Northrop Grumman Systems Corporation : Redondo Beach, CA	6.973	0.430	Apr 2018	-		-		-		-	0.000	7.403	-
Top Attack Prototype Development A	SS/CPFF	Orbital ATK : Plymouth, MN	7.962	0.422	Apr 2018	-		-		-		-	0.000	8.384	-
Top Attack Prototype Development B	SS/CPFF	Textron Defense Systems : Wilmington, MA	11.569	0.949	Aug 2018	-		-		-		-	0.000	12.518	-
Technology Maturation Risk Reduction (TMRR) Development A	C/TBD	TBD : TBD	-	-		11.183	Jun 2019	29.988	Feb 2020	-		29.988	Continuing	Continuing	-
Technology Maturation Risk Reduction (TMRR) Development B	C/TBD	TBD : TBD	-	-		11.183	Jun 2019	29.988	Feb 2020	-		29.988	Continuing	Continuing	-
Common Component Communications Study	SS/CPFF	NAL Research Corporation : Manassas, Virginia	-	3.454	Aug 2018	0.708	Feb 2019	-		-		-	0.000	4.162	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Secure Communications Network	SS/CPFF	NGMS : Redondo Beach, CA	-	14.488	Aug 2018	-		-		-		-	0.000	14.488	-
Secure Communications Network	SS/CPFF	Textron Defense Systems : Wilmington, MA	-	14.488	Aug 2018	-		-		-		-	0.000	14.488	-
Prototype Manufacturing Support Contractor	C/CPIF	To Be Determined : To Be Determined	-	-		2.510	Jun 2019	-		-		-	0.000	2.510	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.548		-		-		-	0.000	1.548	-
Subtotal			26.504	34.231		27.132		59.976		-		59.976	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ARDEC Engineering Support	MIPR	ARDEC : Picatinny Arsenal, NJ	9.820	5.578	Mar 2018	7.673	Dec 2018	6.830	Dec 2019	-		6.830	Continuing	Continuing	-
CERDEC Engineering Support	MIPR	CERDEC : Fort Belvoir, VA	1.059	0.889	Mar 2018	0.368	Jan 2019	0.745	Jan 2020	-		0.745	Continuing	Continuing	-
Mitre Engineering Support (C4)	FFRDC	Mitre : McLean, VA	2.697	-		1.080	Aug 2019	1.112	Aug 2020	-		1.112	Continuing	Continuing	-
Fibertek, INC. Operational Contractor Support	C/CPFF	FIBERTEK, INC. : Herndon, VA	0.601	0.130	Feb 2018	-		-		-		-	0.000	0.731	-
General Program Support	C/FFP	Millennium Corporation : Picatinny Arsenal, NJ	0.023	0.425	Mar 2018	-		-		-		-	0.000	0.448	-
General Program Support	C/FFP	To Be Determined : Picatinny Arsenal, NJ	-	-		0.329	May 2019	0.345	May 2020	-		0.345	0.000	0.674	-
ARL Engineering Support	MIPR	ARMY RESEARCH LABORATORY (ARL) : Adelphi, MD	1.486	0.776	Aug 2018	0.682	Jan 2019	0.832	Jan 2020	-		0.832	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Milestone Document Development Support	SS/CPAF	Booze Allen Hamilton : Picatinny Arsenal, NJ	-	2.484	Mar 2018	1.173	Feb 2019	-		-		-	0.514	4.171	-
Milestone Document Development Support	C/CPAF	TBD : Picatinny Arsenal, NJ	-	-		-		2.102	Mar 2020	-		2.102	0.000	2.102	-
NVESD Engineering Support	MIPR	NVESD : Fort Belvoir, VA	0.893	-		0.580	Jan 2019	0.600	Jan 2020	-		0.600	Continuing	Continuing	-
Product Support Integration	SS/FFP	TBD : Picatinny Arsenal, NJ	-	-		0.200	Jan 2019	0.200	Jan 2020	-		0.200	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	-	-		0.069	Dec 2018	-		-		-	0.000	0.069	-
Subtotal			16.579	10.282		12.164		12.766		-		12.766	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Technology Readiness Evaluation Test	MIPR	TBD : TBD	-	-		-		2.300	Apr 2020	-		2.300	0.000	2.300	-
Other Government Agency T&E Support	TBD	TBD : TBD	-	-		0.200		-		-		-	0.000	0.200	-
Subtotal			-	-		0.200		2.300		-		2.300	0.000	2.500	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	55.087	66.050	42.234	79.932	-	79.932	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Model and Simulation Development	[Redacted]				[Redacted]																							
	M&S Dev																											
Materiel Solution Analysis	[Redacted]				[Redacted]																							
	Materiel Solution Analysis																											
Munitions Delivery System Analysis	[Redacted]				[Redacted]																							
	[Redacted]				Munitions Delivery System Analysis																							
Milestone A - Terrain Shaping Obstacle (TSO) Munitions	[Redacted]				1																							
	[Redacted]				MS A TSO Munitions																							
Technology Maturation and Risk Reduction Agreements Award(s) - TSO Munitions	[Redacted]				2																							
	[Redacted]				Contract Award(s) - TSO Munitions																							
Technology Maturation and Risk Reduction (TMRR) - TSO Munitions	[Redacted]				[Redacted]				[Redacted]																			
	[Redacted]				TMRR - TSO Munitions																							
Technology Readiness Evaluation Test	[Redacted]				[Redacted]				3																			
	[Redacted]				[Redacted]				Technology Readiness Evaluation Test																			
Milestone B - TSO Munitions	[Redacted]				[Redacted]				[Redacted]				4															
	[Redacted]				[Redacted]				[Redacted]				MS B - TSO Munitions															
Engineering and Manufacturing Development Contract Award(s) - TSO Munitions	[Redacted]				[Redacted]				[Redacted]				5															
	[Redacted]				[Redacted]				[Redacted]				EMD Award(s) - TSO Munitions															
Engineering and Manufacturing Development - TSO Munitions	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]											
	[Redacted]				[Redacted]				[Redacted]				[Redacted]				EMD - TSO Munitions											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Area Denial Capability Development	2	2025	1	2026
Model and Simulation Development	1	2016	4	2018
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
Milestone A - Terrain Shaping Obstacle (TSO) Munitions	3	2019	3	2019
Technology Maturation and Risk Reduction Agreements Award(s) - TSO Munitions	4	2019	4	2019
Technology Maturation and Risk Reduction (TMRR) - TSO Munitions	3	2019	3	2021
Technology Readiness Evaluation Test	4	2020	4	2020
Milestone B - TSO Munitions	3	2021	3	2021
Engineering and Manufacturing Development Contract Award(s) - TSO Munitions	3	2021	3	2021
Engineering and Manufacturing Development - TSO Munitions	3	2021	3	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	8.920	20.674	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	29.594
E79: <i>SMOKE/OBSCURANT SYSTEM</i>	-	8.920	20.674	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	29.594

Note

The Screening Obscuration Module (SOM) program will transition from Engineering and Manufacturing Development (EMD) to the Production and Deployment phase in FY20.

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 US 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 US 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.

JUONS CC-0557 provides an enhanced early warning, detection, and identification of Chemical Warfare Agents and Toxic Industrial Materials (TIMs) to existing integrated base defense systems. These capabilities are in support of Operation Inherent Resolve and will be fully integrated into the Integrated Base Defense-Kits at 10 Forward Operating Bases in Iraq.

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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.135	24.200	0.000	-	0.000
Current President's Budget	8.920	20.674	0.000	-	0.000
Total Adjustments	1.785	-3.526	0.000	-	0.000
• Congressional General Reductions	-0.006	-0.026			
• Congressional Directed Reductions	-	-3.500			
• Congressional Rescissions	-	-			
• Congressional Adds	2.070	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.279	-			

Change Summary Explanation

FY 2018 change is a result of a \$2.07M Congressional add to support JUONS CC-0557 efforts.

FY 2020 change for Screening Obscuration Module (SOM) program attributable to the transition from Engineering and Manufacturing Development (EMD) to the Production and Deployment phase in FY 2020.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>				Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
E79: <i>SMOKE/OBSCURANT SYSTEM</i>	-	8.920	20.674	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	29.594
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 US 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 US 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.

JUONS CC-0557 provides an enhanced early warning, detection, and identification of Chemical Warfare Agents and Toxic Industrial Materials (TIMs) to existing integrated base defense systems. These capabilities are in support of Operation Inherent Resolve and will be fully integrated into the Integrated Base Defense-Kits at 10 Forward Operating Bases in Iraq.

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 2018	FY 2019	FY 2020
Title: SOM: Product Development	4.529	2.283	-
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.			
FY 2019 Plans: Will continue development, incorporate changes from the DT test.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>	Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Program transitioned to Production and Deployment Phase				
<p>Title: SOM: Test, Evaluation & Other Government Agencies (OGA's)</p> <p>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).</p> <p>FY 2019 Plans: Will continue test and evaluation planning, and conduct DT testing.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program transitioned to Production and Deployment Phase.</p>		1.496	2.465	-
<p>Title: SOM: Project Management</p> <p>Description: Provide Project Management efforts.</p> <p>FY 2019 Plans: Will continue Government program management, systems engineering, and Integrated Product Team (IPT) support.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program transitioned to Production and Deployment Phase.</p>		0.825	0.504	-
<p>Title: CBRN: Theater Chem Bio-Defense</p> <p>Description: CBRN Theater Chemical and Biological Defense efforts.</p> <p>FY 2019 Plans: Begin and complete the integration, testing, and evaluation of multiple sensor systems in the integrated early warning system for 8th Army. Developmental and user testing to ensure suitability and safety of all equipment in preparation for fielding of equipment in theater.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program transitioned to Production and Deployment Phase.</p>		-	14.600	-
<p>Title: JUONS CC-0557</p> <p>Description: Chemical and Biological Stand-off Detection Compatibilities (JUONS CC-0557).</p>		2.070	-	-
<p>Title: FY19 SBIR/STTR Transfer</p>		-	0.822	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>	Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Description: FY19 SBIR/STTR Transfer				
FY 2019 Plans: FY19 SBIR/STTR Transfer				
FY 2019 to FY 2020 Increase/Decrease Statement: FY19 SBIR/STTR Transfer realized in the year of execution				
Accomplishments/Planned Programs Subtotals		8.920	20.674	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
Acquisition Strategy:				
<p>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.</p> <p>JUONS CC-0557: The acquisition strategy includes integration, demonstration and piloting the solution prior to fielding to the 10 FOB locations. Leveraging an existing Federal Acquisition Regulation based contract delivery order to rapidly complete mission requirements.</p> <p>Chemical Biological Radiological and Nuclear (CBRN) Integrated Early Warning (IEW) ONS 17-22580: the \$14.6 million in Fiscal Year 2019 (FY19), 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 1QFY20 to support the deployment of the Full Operational Capability (FOC) in 2QFY20</p>				
E. Performance Metrics				
N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>	Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SOM-Project Management Personnel	MIPR	JPM NBC CA : Edgewood, MD	7.971	0.825	Nov 2017	0.504	Nov 2018	-		-		-	Continuing	Continuing	Continuing
JUONS CC-0557 Project Management Personnel	Various	JPM Guardian : Edgewood, MD	-	0.674	Apr 2018	-		-		-		-	0.000	0.674	-
CBRN-Theater Chem Bio Defense	TBD	JPEO-CBRND : APG	-	-		1.850	Feb 2019	-		-		-	0.000	1.850	-
Subtotal			7.971	1.499		2.354		-		-		-	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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SOM Product Development	C/CPIF	L3 : Melbourne, FL	28.050	4.529	Feb 2018	2.283	Feb 2019	-		-		-	Continuing	Continuing	Continuing
CBRN-Theater Chem Bio Defense	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	Aug 2018	-		-		-		-	0.000	1.396	-
CBRN-Theater Chem Bio Defense	MIPR	ECBC : APG	-	-		3.000	Feb 2019	-		-		-	0.000	3.000	-
Subtotal			28.050	5.925		12.033		-		-		-	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FY 2019 SBIR / STTR Transfer	TBD	Headquarters, Department of the	-	-		0.822	Jan 2019	-		-		-	0.000	0.822	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603627A / Smoke, Obscurant and Target Defeating Sys-Adv Dev				E79 / SMOKE/OBSCURANT SYSTEM							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		Army : Washington, DC													
Subtotal			-	-		0.822		-		-		-	0.000	0.822	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
SOM Test, Evaluation & OGA's	MIPR	Various OGA : Various	2.263	1.496	Mar 2018	2.465	Nov 2018	-		-		-	Continuing	Continuing	Continuing
CBRN-Theater Chem Bio Defense	MIPR	Various OGAs : Various	-	-		3.000	Jan 2019	-		-		-	0.000	3.000	-
Subtotal			2.263	1.496		5.465		-		-		-	Continuing	Continuing	N/A
Project Cost Totals			38.284	8.920		20.674		-		-		-	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>	Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
SOM Design and Fabrication																												
SOM Developmental Testing #1																												
SOM Developmental Testing #2																												
SOM User Testing																												
SOM MS C																												
SOM Production Award																												
SOM Production																												
SOM FAT																												
JUONS CC-0557 Development/Demonstration																												
ONS 17-22580																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603627A / <i>Smoke, Obscurant and Target Defeating Sys-Adv Dev</i>	Project (Number/Name) E79 / <i>SMOKE/OBSCURANT SYSTEM</i>

Schedule Details

Events	Start		End	
	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	3	2020	3	2022
SOM FAT	1	2021	1	2021
JUONS CC-0557 Development/Demonstration	2	2017	2	2019
ONS 17-22580	1	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0603639A / Tank and Medium Caliber Ammunition							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	45.448	41.921	82.146	-	82.146	50.948	58.995	55.524	51.336	Continuing	Continuing
694: Medium Caliber Ammunition	-	8.960	1.482	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.442
BQ4: 155mm Artillery Propulsion XM654	-	0.000	0.000	7.200	-	7.200	0.000	0.000	0.000	0.000	0.000	7.200
EB8: OWL for Small Caliber Ammunition	-	4.097	2.174	2.000	-	2.000	0.000	0.000	0.000	0.000	0.000	8.271
EB9: Aviation Airborne Expandable Countermeasures	-	8.500	2.471	3.186	-	3.186	4.500	6.060	0.000	0.000	0.000	24.717
EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	0.000	3.755	6.821	-	6.821	0.000	0.000	0.000	0.000	0.000	10.576
EC3: Ammunition Logistics Prototyping	-	1.677	1.313	1.525	-	1.525	1.715	2.170	1.800	1.836	0.000	12.036
EL7: Reduced Range Ammunition	-	3.429	7.609	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.038
EL8: LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER	-	2.870	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.870
EU3: .50 Caliber All-Purpose Tactical Cartridge (APTC)	-	0.000	0.000	4.250	-	4.250	0.000	0.000	0.000	0.000	0.000	4.250
FA5: Assured Precision Weapons and Munitions	-	12.480	14.322	31.267	-	31.267	29.907	31.000	31.000	25.000	Continuing	Continuing
FG1: Cannon-Delivered Area Effects Munitions (C-DAEM)	-	0.960	4.941	25.897	-	25.897	14.826	19.765	22.724	24.500	Continuing	Continuing
XT5: 30mm Anti-Personnel and Counter UAS	-	2.475	3.854	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.329

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army Date: March 2019

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

Note
In FY 2020, Program Element 0603639A, Project BQ4, 155mm Artillery Propulsion XM654, will transition from Budget Activity 03, PE 0603004A, Project 232, Advanced Lethality & Survivability Demo. This Project is not a New Start.
In FY 2020, Program Element 0603639A, Project EU3, 50 Caliber All-Purpose Tactical Cartridge (APTC), is a New Start.

A. Mission Description and Budget Item Justification

The Tank and Medium Caliber Ammunition Program Element (PE) 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 U.S. maneuver forces against the full range of modern battlefield threats. To achieve this, the Tank and Medium Caliber Ammunition Program will identify and develop promising technologies through competitive development and streamlined acquisition procedures.

Project 694, Medium Caliber Ammunition: Develop 30x113mm 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 (JUON CC-0558) 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 funding requested in FY 2020.

Project BQ4, 155mm Artillery Propulsion XM654: The XM654E2 Supercharge is a unitary top-zone 155mm propelling charge optimized and required for use with 58-caliber XM907E2 Extended Range Cannon with Slide-block breech for use with the XM1299 Extended Range Cannon Artillery (ERCA) Self-propelled Howitzer (SPH). It will achieve lethality overmatch at ranges of approximately 70km from XM907E2 Extended Range Cannon with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. The XM654E2 Supercharge is composed of combustible cases with integral metal Stub Case utilizing existing electrically initiated Tank Primer and advanced artillery propellant. Knowledge points will determine compatibility with automated ammunition handling systems. FY 2020 funds will support design risk reduction and prototype maturation towards Engineering Manufacturing and Development (EMD) to support ERCA SPH Increment 2 to support of the Army's modernization priorities in support of the National Defense Strategy.

Project EB8, OWL for Small Caliber: The One Way Luminescence (OWL) project is a critical technology development in response to the 7.62mm 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 day/night 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. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. FY 2020 funding supports continued testing and evaluation of the 5.56mm OWL prototype solutions in order to mature the Technology Readiness Level (TRL).

Project EB9, Aviation Airborne Expandable Countermeasures: This project supports the advanced development activities and technology demonstrations of the Aviation Airborne Expendable Countermeasure (AAECM). These advanced decoys are necessary to address emerging threats and capabilities 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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	
<p>(SAM) systems. These efforts will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will help expedite technology transition from the laboratory to operational use by demonstrating component and subsystem maturity prior to integration into major and complex Army aircraft platforms. These expendable countermeasures systems are an essential part of survivability equipment for Army aircraft. Army RDT&E efforts are coordinated with the PEO Aviation and its platform program managers and with PM Aircraft Survivability Equipment (ASE) to address emerging Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter - Unmanned Aerial Systems (CUAS). Continue to develop and prepare documentation for Milestone A decision for the Radar Guided decoy. This decoy is designed to defeat specific threat types. Details of their operation is classified. Conduct initial developmental/operational testing on XM215 and RF Countermeasures (CM).</p> <p>Project EC2, The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62mm 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 Section 804 Authority. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges. The nomenclature for the 7.62mm ADVAP is XM1158.</p> <p>The Next Generation Squad Weapons (NGSW) ammunition has a similar objective to the 7.62mm ADVAP which is to defeat hard targets. The 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) both 7.62mm XM1158 cartridge for the M240 machine gun and ADVAP ammunition in calibers below 7.62mm.</p> <p>FY 2020 funding supports continuing rapid prototyping/development of the Next Generation Squad Weapons (NGSW) Special Purpose (SP) projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing. FY 2020 funding also supports conducting a Preliminary Design Review (PDR) for the SP projectile and performing activities to increase prototype capacity to support planned weapon system testing.</p> <p>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 2020 funding will be used to complete verification testing and an operational demonstration for the environmental health monitoring system. FY 2020 funding will also be used to continue verification testing of a type two prototype next generation temperature/humidity sensor with batch interrogation and historical data retention capabilities, which will be used for assessing munitions reliability.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>
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Project EL7, Reduced Range Ammunition: The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62mm and .50 caliber Capabilities Development Documents (CDD). The overall objective of Reduced Range Ammunition 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. Reduce Range Ammunition will mitigate a training gap on installations by providing a materiel solution that meets training needs while shortening and condensing the surface danger zone. This will allow soldiers to train with 7.62mm and .50 caliber weapons on restricted ranges. The Reduced Range Ammunition 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 2020.

Project EL8, Lightweight Cartridge Case for Small Caliber: The Lightweight Small Caliber Ammunition (LSCA) Project is a critical technology development in response to the 7.62mm Capabilities Development Documents (CDD). The goal of the LSCA Project is to reduce the total Soldier load through reduction in ammunition weight. The Lightweight Small Caliber Ammunition Project will develop and field 7.62mm lightweight small caliber ammunition cartridges that will provide the same capabilities as the M80A1 and M62A1 cartridges. The Lightweight Small Caliber Ammunition cartridge will be designed to be compatible with all Army 7.62mm weapon systems, but optimized to work in the M240 Machine Gun. No funding requested in FY 2020.

Project EU3, .50 Caliber All-Purpose Tactical Cartridge (APTC): The All-Purpose Tactical Cartridge (APTC) project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of All-Purpose Tactical Cartridge is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The All-Purpose Tactical Cartridge will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. FY 2020 funding supports Technology Maturation and Risk Reduction (TMRR) in preparation for a Technology Readiness Level (TRL) 6, conducting a Materiel Development Decision (MDD), and conducting Design Verification Tests.

Project FA5, 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 Assured Precision Weapons and Munitions Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping that increase lethality and ensure future combat overmatch success of the Joint Force against peer/near-peer adversaries as well as improving 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 GPS coordinated efforts. The Assured Precision Weapons and Munitions Project directly supports Army Modernization Priorities 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 and Army's Assured PNT programs. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a system of-systems environment, Army M-Code GPS technology integration and evaluation, and maturation of alternative positioning, navigation and timing related technologies to enable informed Assured PNT related program of record milestone and Army cross-functional modernization decisions.

Project FG1, Cannon-Delivered Area Effects Munitions (C-DAEM): The Cannon-Delivered Area Effects Munitions (C-DAEM) Project is a two increment approach to provide 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. The purpose of the C-DAEM AoA was to inform acquisition and investment decisions by the

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>
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Army regarding replacement of the current stockpile of 155mm Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense policy compliant munitions and address anti-armor and extended range capability requirements identified in the C-DAEM Initial Capabilities Document (ICD). The Army validated a two increment solution for C-DAEM. Increment I will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. Increment II will destroy personnel, materiel, air defense artillery and rocket launchers. Increment I and II will be developed simultaneously. FY 2020 resources will fund the competitive demonstrations for Increment I, as well as early detailed design testing supporting the qualification of Increment II 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 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 FY 2020.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	41.452	41.974	43.272	-	43.272
Current President's Budget	45.448	41.921	82.146	-	82.146
Total Adjustments	3.996	-0.053	38.874	-	38.874
• Congressional General Reductions	-0.026	-0.053			
• Congressional Directed Reductions	-10.000	-			
• Congressional Rescissions	-	-			
• Congressional Adds	10.450	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	4.804	-			
• SBIR/STTR Transfer	-1.232	-			
• Adjustments to Budget Years	-	-	38.874	-	38.874

Change Summary Explanation

FY 2020 increase of \$20.674 million to support the Army's modernization priorities in support of the National Defense Strategy.
 FY 2018 Congressional increase of \$8.000 million to Project 694, Medium Caliber Ammunition.
 FY 2018 Congressional increase of \$2.450 million to Project EB9, Aviation Airborne Expandable Countermeasures.
 FY 2018 Congressional decrease of \$10.000 million to Project EU1, Enhanced Lethality Cannon Munitions.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
694: Medium Caliber Ammunition	-	8.960	1.482	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.442
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Program Element (PE) 0603639A, Project 694, Medium Caliber Ammunition funds 30x113mm ammunition development and improvement efforts beginning in FY 2018.

A. Mission Description and Budget Item Justification

Develop 30x113mm 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 (JUON CC-0558) 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 FY 2020 request.

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

	FY 2018	FY 2019	FY 2020
Title: Linked 30x113mm Ammunition Qualification and Airburst Development	8.960	1.435	-
Description: Qualify linked 30x113mm ammunition and develop self-destructing and airburst capable munitions.			
FY 2019 Plans: FY 2019 funds will be used to purchase links and linked ammunition necessary to conduct weapon system integration, testing and evaluation, and to support the Urgent Materiel Release (UMR) of the 30x113mm self destruct munitions and development of an airbursting munition.			
FY 2019 to FY 2020 Increase/Decrease Statement: Program will complete testing in FY 2019.			
Title: FY 2019 SBIR / STTR Transfer	-	0.047	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	8.960	1.482	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) 694 / <i>Medium Caliber Ammunition</i>

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

Remarks

D. Acquisition Strategy

An other transaction agreement (OTA) contract will be used 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 2019. Purchase of linked M788 and M789 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
30x113mm Self Destruct and Airburst Ammo Development Contract	C/CPFF	Northrop Grumman Innovation Systems (NGIS) : Plymouth, MN	-	7.771	Aug 2018	0.635	Jan 2019	-		-		-	0.000	8.406	-
30x113mm Linked Ammo Development Contract	C/CPFF	Northrop Grumman Innovation Systems (NGIS) : Plymouth, MN	-	0.052	Aug 2018	-		-		-		-	0.000	0.052	-
30x113mm Ammo Fuze Development	C/CPFF	Electronics Development Corporation (EDC) : Columbia, MD	-	0.207	Jun 2018	-		-		-		-	0.000	0.207	-
Program Manager Maneuver Ammunition Systems (PM MAS)	MIPR	PM MAS : Picatinny, NJ	-	0.230	Oct 2017	-		-		-		-	0.000	0.230	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.047		-		-		-	0.000	0.047	-
Subtotal			-	8.260		0.682		-		-		-	0.000	8.942	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
30x113mm Ammo Armament Research Development and Engineering Center (ARDEC)	MIPR	Armament Research Development and Engineering Center (ARDEC) : Picatinny, NJ	-	-		0.200	Nov 2018	-		-		-	0.000	0.200	-
Subtotal			-	-		0.200		-		-		-	0.000	0.200	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Proximity Ammo Demonstration	MIPR	Aberdeen Testing Center (ATC) : Aberdeen, MD	-	-		0.300	Jul 2019	-		-		-	0.000	0.300	-
Self Destruct Safety Certification Testing	MIPR	Yuma Test Center (YTC) : Aberdeen, MD	-	0.700	Dec 2018	-		-		-		-	0.000	0.700	-
Self Destruct Ammo System Integration Testing	MIPR	Yuma Test Center (YTC) : Aberdeen, MD	-	-		0.300	Jun 2019	-		-		-	0.000	0.300	-
Subtotal			-	0.700		0.600		-		-		-	0.000	1.300	N/A
Project Cost Totals			-	8.960		1.482		-		-		-	0.000	10.442	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) 694 / <i>Medium Caliber Ammunition</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
30x113mm Ammo Development Contract Award					▲ 1	30x113mm Ammo Contract Award																						
30x113mm Ammo Development					■	30x113mm Ammo Development																						
30x113mm Proximity Ammo Demonstration									▲ 2	30x113mm Prox Ammo Demo																		
30x113mm Self Destruct Safety Certification Test									■	30x113mm Self Destruct Safety Cert																		
30x113mm Self Destruct System Integration Testing									■	30x113mm Self Destruct Integration Testing																		
30x113mm Self Destruct Ammo Urgent Material Release									▲ 3	30x113mm Self Destruct UMR																		

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) 694 / <i>Medium Caliber Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
30x113mm Ammo Development Contract Award	4	2018	4	2018
30x113mm Ammo Development	4	2018	3	2019
30x113mm Proximity Ammo Demonstration	4	2019	4	2019
30x113mm Self Destruct Safety Certification Test	2	2019	3	2019
30x113mm Self Destruct System Integration Testing	3	2019	4	2019
30x113mm Self Destruct Ammo Urgent Material Release	4	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BQ4: 155mm Artillery Propulsion XM654	-	0.000	0.000	7.200	-	7.200	0.000	0.000	0.000	0.000	0.000	7.200
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020, this Project will transition from Budget Activity 03, PE 0603004A, Project 232, Advanced Lethality & Survivability Demo. This Project is not a New Start.

A. Mission Description and Budget Item Justification

The XM654E2 Supercharge is a unitary top-zone 155mm propelling charge optimized and required for use with 58-caliber XM907E2 Extended Range Cannon with Slide-block breech for use with the XM1299 Extended Range Cannon Artillery (ERCA) Self-propelled Howitzer (SPH). It will achieve lethality overmatch at ranges of approximately 70km from XM907E2 Extended Range Cannon with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. The XM654E2 Supercharge is composed of combustible cases with integral metal Stub Case utilizing existing electrically initiated Tank Primer and advanced artillery propellant. Knowledge points will determine compatibility with automated ammunition handling systems. FY 2020 funds will support design risk reduction and prototype maturation towards Engineering Manufacturing and Development (EMD) to support ERCA SPH Increment 2 and in support of the Army's modernization priorities in support of the National Defense Strategy.

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

	FY 2018	FY 2019	FY 2020
Title: 155mm Artillery Propulsion XM654 Supercharge	-	-	7.200
Description: Unitary top-zone propelling charge for XM907E2 Extended Range Cannon with Slide-block breech for use with ERCA INC 2 to regain range overmatch for 155mm artillery.			
FY 2020 Plans: Perform charge establishment and charge uniformity in preparation for ballistic testing including preliminary blast overpressure and charge verification across operational temperatures. Perform packaging rough handling testing. Evaluate risk reduction activities prior to Milestone B.			
FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funds from FY 2019 to FY 2020 due to continuation of XM654E2 Supercharge efforts from Science & Technology (S&T) for risk reduction and prototype maturation. This Project is not a New Start.			
Accomplishments/Planned Programs Subtotals	-	-	7.200

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>			<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• 232: <i>Advanced Lethality & Survivability Demo</i>	99.265	70.340	0.000	-	0.000	-	-	-	-	0.000	169.605

Remarks

In FY 2020, this Project will transition from Budget Activity 03, PE 0603004A, Project 232, Advanced Lethality & Survivability Demo. This Project is not a New Start. In FY 2021, this Project will transition to Budget Activity 05, PE 0604802A Project BQ3, 155mm Artillery Propulsion XM654. A Procurement Ammunition, Army funding line will be established in FY 2025.

D. Acquisition Strategy

The XM654E2 Supercharge Technology Maturation and Risk Reduction (TMRR) effort will consist of critical technology prototyping, testing, and demonstration. 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 into developmental extended range projectiles and fuzes. After achieving Milestone B, the XM654E2 Supercharge Project will conduct competitive Engineering Manufacturing and Development (EMD) tasks aimed at meeting the validated requirement in preparation for Low Rate Initial Production (LRIP).

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	-		-		0.150	Oct 2019	-		0.150	0.000	0.150	-
Subtotal			-	-		-		0.150		-		0.150	0.000	0.150	N/A

Remarks
Program Management includes Supercharge travel and milestone documentation support.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Supercharge Prototype Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		-		1.339	Oct 2019	-		1.339	0.000	1.339	-
Developmental Projectile/ Fuze Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		-		1.030	Oct 2019	-		1.030	0.000	1.030	-
Subtotal			-	-		-		2.369		-		2.369	0.000	2.369	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	MIPR	Armament Research Development Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		-		4.281	Oct 2019	-		4.281	0.000	4.281	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army											Date: March 2019				
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		4.281		-		4.281	0.000	4.281	N/A

Remarks
Engineering support required for ongoing XM654E2 design risk reduction and prototype maturation efforts.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Supercharge Prototype Testing	MIPR	Army Test & Evaluation Command (ATEC) : Yuma, AZ	-	-		-		0.400	Oct 2019	-		0.400	0.000	0.400	-
Subtotal			-	-		-		0.400		-		0.400	0.000	0.400	N/A

Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		7.200		-	7.200	0.000	7.200	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Supercharge Prototyping									Prototyping																			
Supercharge Prototype Testing									Testing																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Supercharge Prototyping	1	2020	4	2020
Supercharge Prototype Testing	1	2020	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EB8: OWL for Small Caliber Ammunition	-	4.097	2.174	2.000	-	2.000	0.000	0.000	0.000	0.000	0.000	8.271
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber One Way Luminescence (OWL) technology applies to multiple calibers. In FY 2019, Budget Activity 4 (BA4) Program Element (PE) 0603639A, Project EB8, 7.62mm OWL transitions to Budget Activity 5 (BA5) PE 0604802A, Project EP4, 7.62mm OWL. In FY 2021, BA4 PE 0603639A, Project EB8, 5.56mm OWL transitions to BA5 PE 0604802A, Project EP4, 5.56mm OWL

A. Mission Description and Budget Item Justification

The One Way Luminescence (OWL) project is a critical technology development in response to the 7.62mm 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 day/night 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. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. FY 2020 funding supports continued testing and evaluation of the 5.56mm OWL prototype solutions in order to mature the Technology Readiness Level (TRL).

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

	FY 2018	FY 2019	FY 2020
Title: Technology Maturation and Risk Reduction (TMRR)	4.097	2.104	2.000
Description: One Way Luminescence (OWL) will develop and demonstrate a full day/night tracer technology that eliminates the shortcomings of current legacy tracers.			
FY 2019 Plans: FY 2019 efforts will continue activities to mature 5.56mm Technology Readiness Level (TRL). The 5.56mm efforts include development, procurement, and testing of multiple competing prototype solutions to reduce risk in meeting user requirements. Funding will also support exploring implementation of OWL technology in .50 Caliber and other small caliber ammunition.			
FY 2020 Plans: FY 2020 efforts will continue activities to mature 5.56mm Technology Readiness Level (TRL). Plans include testing 5.56mm prototype solutions in preparation for TRL 6. Evaluate .50 Caliber and other small caliber ammunition OWL technology/prototype ammunition and mature TRLs.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Technology maturation of the 5.56mm OWL started in FY 2018. The FY 2020 funding furthers the planned development of the 5.56mm and other small caliber OWL technology.			
Title: FY 2019 SBIR / STTR Transfer	-	0.070	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	4.097	2.174	2.000

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EP4: <i>One-Way Luminescence for Small Caliber Ammo</i>	-	6.077	8.547	-	8.547	12.391	5.387	6.500	3.000	0.000	41.902

Remarks
Budget Activity 5 (BA5) Program Element (PE) 0604802A, Project EP4

D. Acquisition Strategy
The One Way Luminescence (OWL) technology will be integrated into the M80A1 trace ammunition production. The OWL concept will be developed through Government and Industry prototyping efforts. A Technology Readiness Assessment (TRA) was conducted in FY 2015 and FY 2016 to measure the progress of the designs. The FY 2017 and FY 2018 TRAs were conducted 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 Engineering and Manufacturing Development (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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Program Manager Maneuver Ammunition Systems (PM MAS) : Picatinny, NJ	0.370	0.022	Oct 2017	-		-		-		-	0.600	0.992	-
Physical Optics Corporation	C/FFP	Physical Optics Corporation : Torrance, CA	1.080	-		-		-		-		-	0.000	1.080	-
Battelle Memorial Institute	C/FFP	Battelle Memorial Institute : Columbus, OH	0.716	-		-		-		-		-	0.000	0.716	-
Tooling	Option/ FFP	SAVIT Corporation : Rockaway, NJ	0.209	0.392	Oct 2017	-		-		-		-	0.000	0.601	-
Tooling Development	Option/ CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	-		0.800	Feb 2019	0.250	Feb 2020	-		0.250	0.000	1.050	Continuing
Prototype Development Contract 1	Option/ CPFF	General Dynamics : Florham Park, NJ	-	0.515	Jul 2018	-		0.400	Feb 2020	-		0.400	0.000	0.915	Continuing
Prototype Development Contract 2	Option/ CPFF	Nammo Tally : Mesa, AZ	-	0.515	Jul 2018	-		0.400	Feb 2020	-		0.400	0.000	0.915	Continuing
Projectile Development	MIPR	Armament Research Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	0.125	Oct 2017	-		-		-		-	0.000	0.125	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.070		-		-		-	0.000	0.070	-
Subtotal			2.375	1.569		0.870		1.050		-		1.050	0.600	6.464	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research Development and Engineering Center (ARDEC)	MIPR	Armament Research Development and Engineering Center (ARDEC) : Picatinny, NJ	3.269	2.203	Oct 2017	1.254	Oct 2018	0.575	Oct 2019	-		0.575	2.498	9.799	Continuing
Subtotal			3.269	2.203		1.254		0.575		-		0.575	2.498	9.799	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Research Lab (ARL)	MIPR	Army Research Lab (ARL) : Aberdeen, MD	0.278	-		0.030	Oct 2018	0.040	Oct 2019	-		0.040	1.500	1.848	Continuing
Army Corps of Engineers	MIPR	Army Corps of Engineers : Vicksburg, MO	0.313	0.075	Apr 2018	-		0.035	Oct 2019	-		0.035	1.500	1.923	Continuing
Night Vision Labs (NVL)	MIPR	Night Vision Labs (NVL) : Fort Belvoir, VA	0.040	-		-		-		-		-	0.000	0.040	-
US Army Aberdeen Test Center (ATC)	MIPR	US Army Aberdeen Test Center (ATC) : Aberdeen, MD	0.101	-		-		-		-		-	0.000	0.101	-
Army Joint Munitions Command	MIPR	Army Joint Munitions Command : Rock Island, IL	0.154	0.050	Oct 2017	0.020	Oct 2018	0.050	Oct 2019	-		0.050	0.000	0.274	-
Naval Air Warfare Center	MIPR	Naval Air Warfare Center : Patuxent River, MD	0.137	-		-		-		-		-	0.000	0.137	-
Prototype testing	Option/ FFP	Double B Enterprises : Malvern, IA	-	0.200	Jan 2018	-		0.250	Feb 2020	-		0.250	0.000	0.450	Continuing
Subtotal			1.023	0.325		0.050		0.375		-		0.375	3.000	4.773	N/A

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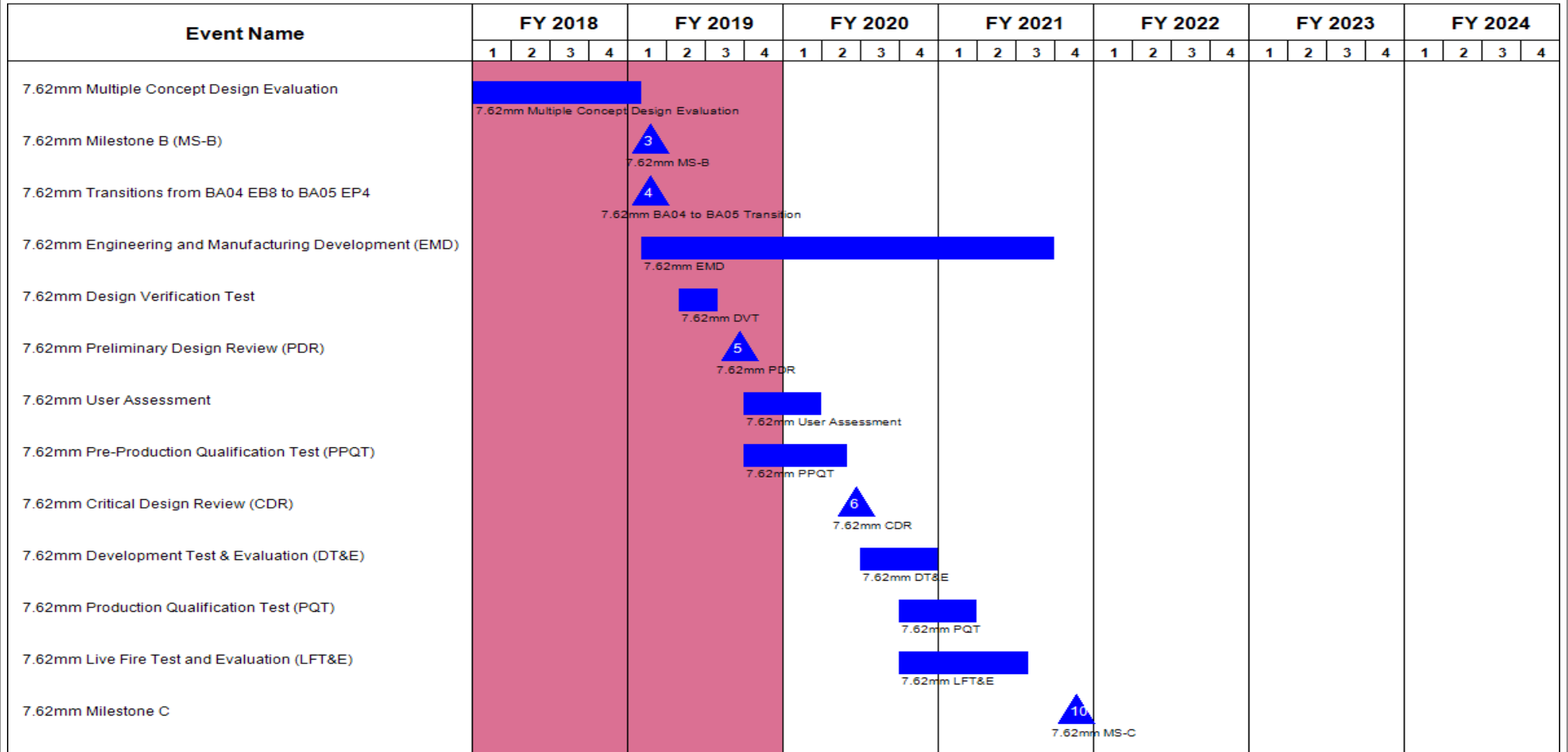
Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army							Date: March 2019				
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>				Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>				

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	6.667	4.097	2.174	2.000	-	2.000	6.098	21.036	N/A

Remarks

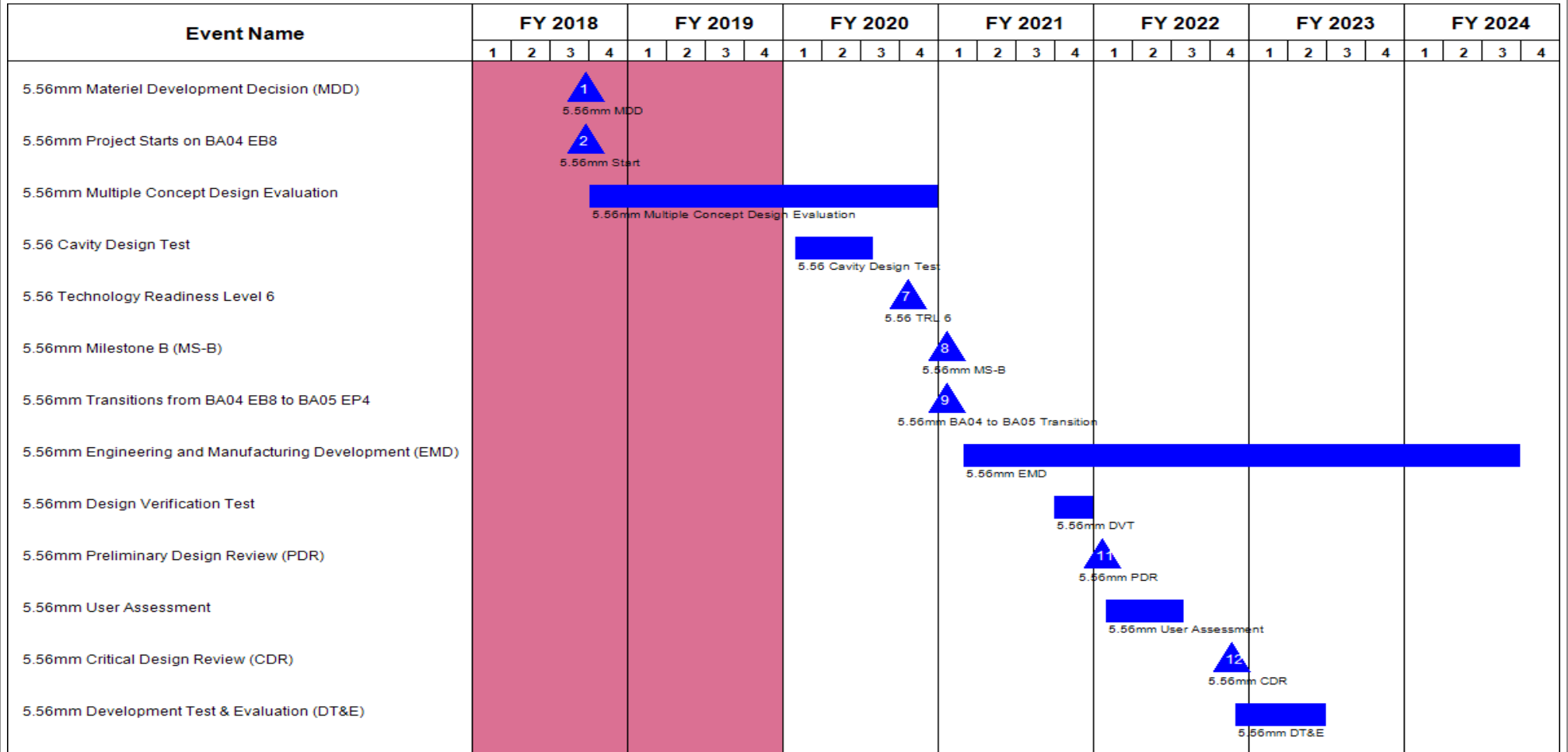
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>



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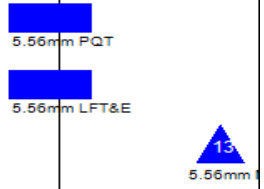
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EB8 / OWL for Small Caliber Ammunition



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
5.56mm Production Qualification Testing (PQT)																												
5.56mm Live-Fire Test and Evaluation (LFT&E)																												
5.56mm Milestone C (MS-C)																												
.50 caliber Concept Design Evaluation																												



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
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	2021
7.62mm Design Verification Test	2	2019	3	2019
7.62mm Preliminary Design Review (PDR)	3	2019	3	2019
7.62mm User Assessment	4	2019	1	2020
7.62mm Pre-Production Qualification Test (PPQT)	4	2019	2	2020
7.62mm Critical Design Review (CDR)	2	2020	2	2020
7.62mm Development Test & Evaluation (DT&E)	3	2020	4	2020
7.62mm Production Qualification Test (PQT)	4	2020	1	2021
7.62mm Live Fire Test and Evaluation (LFT&E)	4	2020	3	2021
7.62mm Milestone C	4	2021	4	2021
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
5.56 Cavity Design Test	1	2020	3	2020
5.56 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
5.56mm Engineering and Manufacturing Development (EMD)	1	2021	3	2024
5.56mm Design Verification Test	4	2021	4	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
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	2	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
.50 caliber Concept Design Evaluation	1	2020	3	2020

Note

As the technology matures, the One Way Luminescence (OWL) projects transitions from Budget Activity 4 (BA4) PE 0603639A, Project EB8 to Budget Activity 5 (BA5) PE 0604802A, Project EP4.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) EB9 / Aviation Airborne Expandable Countermeasures			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EB9: Aviation Airborne Expandable Countermeasures	-	8.500	2.471	3.186	-	3.186	4.500	6.060	0.000	0.000	0.000	24.717
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports the advanced development activities and technology demonstrations of the Aviation Airborne Expendable Countermeasure (AAECM). These advanced decoys are necessary to address emerging threats and capabilities 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. These efforts will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will help expedite technology transition from the laboratory to operational use by demonstrating component and subsystem maturity prior to integration into major and complex Army aircraft platforms. These expendable countermeasures systems are an essential part of survivability equipment for Army aircraft. Army RDT&E efforts are coordinated with the PEO Aviation and its platform PMs with PM Aircraft Survivability Equipment (ASE) to address emerging Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter - Unmanned Aerial Systems (CUAS). Continue to develop and prepare documentation for Milestone A decision for the Radar Guided decoy. This decoy is designed to defeat specific threat types. Details of their operation is classified. Conduct initial developmental/operational testing on XM215 and RF Countermeasures (CM).

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

	FY 2018	FY 2019	FY 2020
Title: Expendable Countermeasures to Guided Missile Threats	8.500	2.392	3.186
Description: This program will develop expendable countermeasure (CM) decoys which will protect Army aircraft from surface-to-air missiles.			
FY 2019 Plans: Conduct demonstration efforts and flight testing on XM215 Countermeasures (CM) and Radio Frequency (RF) CM based on modeling and simulation efforts. Conduct flight testing for both XM215 and RF Passive countermeasure solutions.			
FY 2020 Plans: Conduct optimization for the XM215 during Technology Maturation & Risk Reduction (TMRR), System Requirements Review (SRR) and flight testing. Continue maturing prototype design and technology and Pre-Engineering and Manufacturing Development (EMD) review. Prepare Initial documentation to support Milestone B for RF Countermeasures. Conduct Pre-EMD review and Preliminary Design Review (PDR) for RF Countermeasures.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding is increasing commensurate with additional support and analysis required as the program progresses.			
Title: FY 2019 SBIR / STTR Transfer	-	0.079	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expendable Countermeasures</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<i>FY 2019 Plans:</i> FY 2019 SBIR / STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	8.500	2.471	3.186

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• EP7: <i>Aviation Airborne Expendable Countermeasures</i>	-	7.213	4.920	-	4.920	4.480	8.250	-	-	0.000	24.863

Remarks

D. Acquisition Strategy
A Technical Development Strategy (TDS) for the development and production of Flare, Aircraft: Countermeasure XM215 and Radar Frequency (RF) Decoys under the Aviation Airborne Expendable Countermeasure (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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EB9 / Aviation Airborne Expandable Countermeasures
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management	MIPR	PM Close Combat Systems : Picatinny Arsenal	0.455	-		-		-		-		-	0.000	0.455	-
Subtotal			0.455	-		-		-		-		-	0.000	0.455	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Prototype Development XM215 (1)	C/FFP	ACC : Picatinny Arsenal	2.046	0.592	Oct 2018	-		1.450	May 2020	-		1.450	0.000	4.088	-
Prototype Development XM215 (2)	C/FFP	ACC : Picatinny Arsenal	-	0.412	Oct 2018	-		-		-		-	0.000	0.412	-
Prototype Development XM215 (3)	C/FFP	ACC : Picatinny Arsenal	-	0.515	Aug 2018	-		-		-		-	0.000	0.515	-
Prototype Development XM215 (4)	C/FFP	ACC : Picatinny Arsenal	-	0.206	Oct 2018	-		-		-		-	0.000	0.206	-
Prototype Development XM215 (5)	C/FFP	ACC : Picatinny Arsenal	-	0.250	Jan 2019	-		-		-		-	0.000	0.250	-
Prototype Development RF	C/FFP	ACC : Picatinny Arsenal	-	0.773	Sep 2018	1.300	Jun 2019	-		-		-	0.000	2.073	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.079		-		-		-	0.000	0.079	-
Subtotal			2.046	2.748		1.379		1.450		-		1.450	0.000	7.623	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support XM215	MIPR	ARDEC : Picatinny Arsenal	1.719	0.468	Sep 2018	-		0.280	Dec 2019	-		0.280	0.000	2.467	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EB9 / Aviation Airborne Expandable Countermeasures							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support RF	MIPR	ARDEC : Picatinny Arsenal	-	0.650	Sep 2018	-		0.456	Dec 2019	-		0.456	0.000	1.106	-
HILT T-SPIL	MIPR	TBB : China Lake CA	-	0.300		-		-		-		-	0.000	0.300	-
Subtotal			1.719	1.418		-		0.736		-		0.736	0.000	3.873	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Flight Test and Evaluation XM215	MIPR	TBD : TBD	0.950	1.782	Feb 2019	1.092	Apr 2019	-		-		-	0.000	3.824	-
Modeling & Simulation	MIPR	ARDEC : Picatinny Arsenal	-	1.072	Jun 2018	-		-		-		-	0.000	1.072	-
AOA Development	MIPR	AMSAA : APG, MD	0.261	-		-		-		-		-	0.000	0.261	-
AOA Development	MIPR	TRAC : Ft Leavenworth, KS	0.550	-		-		-		-		-	0.000	0.550	-
Flight Test and Evaluation RF	MIPR	PAX River : PAX River	-	0.705	Jun 2018	-		1.000	Apr 2020	-		1.000	0.000	1.705	-
Modeling & Simulation RF	MIPR	AFRL : AFRL	-	0.550		-		-		-		-	0.000	0.550	-
Modeling & Simulation RF	MIPR	ARDEC : Picatinny Arsenal	-	0.225	Aug 2018	-		-		-		-	0.000	0.225	-
Subtotal			1.761	4.334		1.092		1.000		-		1.000	0.000	8.187	N/A
Project Cost Totals			5.981	8.500		2.471		3.186		-		3.186	0.000	20.138	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expandable Countermeasures</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Matériel Development Documentation and Decision for XM215	■																											
Analysis of Alternatives	■																											
Demonstration Contract Preparation XM215				■																								
Milestone A XM215								▲ 2																				
Demonstration Down Select XM215								▲ 4																				
Prototyping XM215					■																							
Testing Efforts (Stability/Heat/Cold) XM 215					■																							
Flight Testing XM 215												■																
Milestone B XM215																▲ 6												
Demonstration Contract Preparation RF Countermeasure				■																								
Milestone A RF Countermeasure								▲ 3																				
Contract Award RF Countermeasure				▲ 1																								
Demonstrations RF Countermeasure					■																							

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expandable Countermeasures</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Prototype Development RF Countermeasure																												
Flight Testing RF Countermeasure																												
Data Analysis RF Countermeasure																												
Milestone B RF Countermeasure																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expandable Countermeasures</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Material Development Documentation and Decision for XM215 CM	2	2016	2	2018
Analysis of Alternatives	3	2017	3	2018
Demonstration Contract Preparation XM215	4	2018	4	2018
Milestone A XM215	1	2019	1	2019
Demonstration Down Select XM215	3	2019	3	2019
Prototyping XM215	1	2019	2	2020
Testing Efforts (Stability/Heat/Cold) XM 215	2	2019	4	2020
Flight Testing XM 215	3	2020	3	2020
Milestone B XM215	4	2020	4	2020
Demonstration Contract Preparation RF Countermeasure	4	2018	4	2018
Milestone A RF Countermeasure	1	2019	1	2019
Contract Award RF Countermeasure	1	2019	1	2019
Demonstrations RF Countermeasure	1	2019	2	2019
Prototype Development RF Countermeasure	3	2019	4	2019
Flight Testing RF Countermeasure	4	2019	4	2019
Data Analysis RF Countermeasure	4	2019	3	2020
Milestone B RF Countermeasure	3	2020	3	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	0.000	3.755	6.821	-	6.821	0.000	0.000	0.000	0.000	0.000	10.576
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber Advanced Armor-Piercing (ADVAP) technology has been under development since 2015 and applies to multiple calibers of ammunition. In FY 2017, the funding transitioned from Budget Activity (BA) 04 Program Element (PE) 0603639A, Project EC2 to BA 05, PE 0604802A, Project EP5, Adv Armor-Piercing (ADVAP) for Small Cal Ammo to continue the development of ADVAP 7.62mm ammunition. A follow-on effort to support ADVAP ammunition calibers below 7.62mm commences in FY 2019 under the BA 4, PE 0603639A, Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo. In FY 2021, PE 0603639A, Project EC2, ADVAP will be re-aligned to PE 0604601 Project EV9 prior to the PB 2021 submission to continue development efforts on ADVAP ammunition in calibers below 7.62mm. The effort is not a new start.

A. Mission Description and Budget Item Justification

The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62mm 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 Section 804 Authority. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges. The nomenclature for the 7.62mm ADVAP is XM1158.

The Next Generation Squad Weapons (NGSW) ammunition has a similar objective to the 7.62mm ADVAP which is to defeat hard targets. The 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) both 7.62mm XM1158 cartridge for the M240 machine gun and ADVAP ammunition in calibers below 7.62mm.

FY 2020 funding supports continuing rapid prototyping/development of the Next Generation Squad Weapons (NGSW) Special Purpose (SP) projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing. FY 2020 funding also supports conducting a Preliminary Design Review (PDR) for the SP projectile and performing activities to increase prototype capacity to support planned weapon system testing.

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

	FY 2018	FY 2019	FY 2020
Title: Small Caliber Ammunition Rapid Prototyping	-	3.634	6.821

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans: FY 2019 efforts will be focused on rapid prototyping/development of the General Purpose (GP) and Special Purpose (SP) projectile to include building and evaluating projectile prototypes to refine concepts and mature the Technology Readiness Level (TRL), conducting a GP Preliminary Design Review (PDR), and preparing for insertion into the rapid prototyping for the Next Generation Squad Weapon system development.</p> <p>FY 2020 Plans: FY 2020 efforts are focused on continuing rapid prototyping/development of the SP projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing. Also, conducting a Preliminary Design Review (PDR) for the SP projectile and performing activities to increase prototype capacity to support planned weapon system testing beginning in FY 2021 and FY 2022.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase needed to fund planned rapid prototyping activities for both the GP and SP ammunition.</p>			
<p>Title: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>	-	0.121	-
Accomplishments/Planned Programs Subtotals	-	3.755	6.821

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• EP5: <i>Adv Armor-Piercing (ADVAP) for Small Caliber Ammo</i>	13.318	16.748	0.000	-	0.000	-	-	-	-	0.000	30.066
• FL4: <i>Small Caliber Ammo for Next Gen Squad Weapons</i>	-	-	22.880	-	22.880	30.630	28.750	25.000	11.750	0.000	119.010

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks

These funding lines support Engineering & Manufacturing Development (EMD) activities for the 7.62mm ADVAP ammunition and rapid prototyping/development of General Purpose (GP) and Special Purpose (SP) ammunition for the Next Generation Squad Weapon (NGSW) systems. Other Program Funding in Budget Activity 05 (BA05) PE 0604802A, Project EP5 and Budget Activity 05 (BA05) PE 0604802A, Project FL4.

D. Acquisition Strategy

The ADVAP ammunition programs will use a Government developed design and manufacturing process. Multiple component contracts will be awarded to purchase raw materials and equipment. In FY 2016, the ADVAP effort accomplished design optimization, manufactured prototypes, and demonstrated TRL 6 for XM1158. Milestone (MS) B occurred in 1st Quarter FY 2017 leading to fabrication and testing of qualification hardware for the 7.62mm cartridge. Follow-on developmental efforts for the ADVAP ammunition calibers below 7.62mm will utilize rapid prototyping acquisition strategy under Section 804 Authority. 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EC2 I Adv Armor-Piercing (ADVAP) for Small Cal Ammo								
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	0.658	-		-		-		-		-	0.600	1.258	-	
Prototype Manufacturing	C/FFP	Jet Industrial : New Jersey	1.039	-		-		-		-		-	2.600	3.639	-	
Phase 1 Propellant Development	C/FFP	ATK : Virginia	0.141	-		-		-		-		-	0.000	0.141	-	
Projectile Development	Option/CPFF	Northrop Grumman Innovation Systems : Independence, MO	-	-		2.825	Jan 2019	3.200	Jan 2020	-		-	3.200	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.121		-		-		-	0.000	0.121	-	
Subtotal			1.838	-		2.946		3.200		-		-	3.200	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	6.387	-		0.659	Oct 2018	1.921	Oct 2019	-		-	1.921	Continuing	Continuing	Continuing
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	1.000	-		-		1.000	Oct 2019	-		-	1.000	Continuing	Continuing	Continuing
Subtotal			7.387	-		0.659		2.921		-		-	2.921	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	3.200	-		0.150	Oct 2018	0.500	Oct 2019	-		-	0.500	Continuing	Continuing	Continuing
U.S. Army Aberdeen Test Center	TBD	Aberdeen : Maryland	-	-		-		0.200	Oct 2019	-		-	0.200	Continuing	Continuing	Continuing

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
NGSW Ammo Rapid Prototyping					NGSW Ammo RP																											
NGSW Ammo Initial Product Review 1 (IPR 1) Special Purpose									1 ▲ NGSW Ammo IPR 1 SP																							
NGSW Ammo Preliminary Design Review General Purpose (PDR-GP)									2 ▲ NGSW Ammo PDR-GP																							
NGSW Ammo Initial Product Review 2 (IPR 2) Special Purpose									3 ▲ NGSW Ammo IPR 2 SP																							
NGSW Ammo Preliminary Design Review Special Purpose (PDR-SP)													4 ▲ NGSW Ammo PDR-SP																			
NGSW Ammo Critical Design Review General Purpose (CDR-GP)																	5 ▲ NGSW Ammo CDR-GP															
NGSW Ammo Prototype Test 1																					6 ■ NGSW Ammo PT1											
NGSW Ammo Initial Product Review 3 (IPR 3) Special Purpose																	7 ▲ NGSW Ammo IPR 3 SP															
NGSW Ammo Full Materiel Release (FMR) Transitions from BA04 EC2 to BA05 FL4																	8 ▲ NGSW Ammo FMR BA04 to BA05 Transition															
NGSW Ammo Critical Design Review Special Purpose (CDR-SF)																	9 ▲ NGSW Ammo CDR-SF															
NGSW Ammo Prototype Test 2																					10 ■ NGSW Ammo PT2											
NGSW Ammo Urgent Materiel Release General Purpose (UMR GP)																									9 ▲ NGSW Ammo UMR GP							
NGSW Ammo Urgent Materiel Release Special Purpose (UMR SP)																									10 ▲ NGSW Ammo UMR SP							

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024																											
	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																								
NGSW Ammo Rapid Fielding																																																				
NGSW Ammo Production Qualification Testing Special Purpose (PQT SP)																																																				
NGSW Ammo Full Materiel Release (FMR)																																																				

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
NGSW Ammo Rapid Prototyping	1	2019	2	2024
NGSW Ammo Initial 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 Initial 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 Initial 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 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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EC3: Ammunition Logistics Prototyping	-	1.677	1.313	1.525	-	1.525	1.715	2.170	1.800	1.836	0.000	12.036
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. FY 2020 funding will be used to complete verification testing and an operational demonstration for the environmental health monitoring system. FY 2020 funding will also be used to continue verification testing of a type two prototype next generation temperature/humidity sensor with batch interrogation and historical data retention capabilities, which will be used for assessing munitions reliability.

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

	FY 2018	FY 2019	FY 2020
Title: Munitions Health and Inventory Monitoring Systems	1.177	0.856	1.025
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 2019 Plans: Complete verification testing and an operational demonstration for the environmental health monitoring system. Continue verification testing of a next generation temperature/humidity sensor with batch interrogation and historical data retention capabilities, which will be used for assessing munitions reliability.			
FY 2020 Plans: Conduct an extended operational demonstration of the environmental health monitoring system to enable condition based management of ammunition. Continue 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 complete an operational demonstration of the type I prototype. Complete operational demonstration of the low cost thermal indicator, which provides passive lifetime temperature exposure sensing.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
FY 2020 funding is slightly higher than FY 2019 due to an anticipated increase in labor and material costs.				
<p>Title: Munitions Containerization Systems</p> <p>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.</p> <p>FY 2019 Plans: Perform design verification prototype testing and award contract to produce production representative polymer containers in preparation for qualification testing with 5.56 mm ammunition.</p> <p>FY 2020 Plans: Perform qualification testing of production representative rectangular polymer container for family of 5.56 mm ammunition. Perform advanced development and prototype demonstration of the plastic cylindrical container in a realistic operating environment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding is slightly higher than FY 2019 due to anticipated increases in labor and material costs.</p>		0.500	0.415	0.500
<p>Title: FY2019 SBIR/STTR Transfer</p> <p>Description: FY 2019 SBIR/STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR/STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR Transfer</p>		-	0.042	-
Accomplishments/Planned Programs Subtotals		1.677	1.313	1.525
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>

D. Acquisition Strategy

Munitions Health Monitoring and Munitions Containerization systems will be developed through government and industry prototype efforts. In FY 2020, a Technology Readiness Assessment will be conducted to measure the progress of the designs.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Contract - Low Cost Thermal Indicator	C/FFP	Innosense : Torrance, CA	1.630	0.509		0.200		0.200	Dec 2019	-		0.200	0.000	2.539	-
Contract - RRAPDS	C/FFP	Phase IV : Boulder, CO	1.053	0.099	Sep 2018	0.400	Jun 2019	-		-		-	0.000	1.552	-
Contract-Plastic Cylindrical Container	C/FFP	SAVIT : Rockaway, NJ	0.550	0.097	Sep 2018	0.150		0.275	Mar 2020	-		0.275	0.000	1.072	-
Contract-Insensitive Munitions	C/TBD	TBD : TBD	0.576	-		-		-		-		-	0.000	0.576	-
Next Generation Temperature Humidity Indicator	C/FFP	AGM : Tuscon, AZ	0.200	0.206	May 2018	0.050		0.400	Dec 2019	-		0.400	0.000	0.856	-
Subtotal			4.009	0.911		0.800		0.875		-		0.875	0.000	6.595	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ARDEC	MIPR	Picatinny Arsenal : NJ	2.827	0.766	May 2018	0.513	Dec 2018	0.400	Dec 2019	-		0.400	0.000	4.506	-
Subtotal			2.827	0.766		0.513		0.400		-		0.400	0.000	4.506	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Yuma Proving Ground	MIPR	Yuma : AZ	0.086	-		-		-		-		-	0.000	0.086	-
Test and Eval	MIPR	TBD : TBD	0.150	-		-		0.250	Mar 2020	-		0.250	0.000	0.400	-
Subtotal			0.236	-		-		0.250		-		0.250	0.000	0.486	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army								Date: March 2019					
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>				Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>					
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	7.072	1.677		1.313		1.525		-		1.525	0.000	11.587	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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 Concept Development-Munitions Health Monitoring-1	RRAPDS-Phase 1																											
Advanced Concept Development-Munitions Health Monitoring-1A																												
Advanced Concept Development-Munitions Health Monitoring-2	Low Cost Thermal Indicator																											
Advanced Concept Development-Munitions Containerization-1																												
Advanced Concept Development-Munitions Containerization-1A									Munitions Containerization-Plastic Rectangular Container																			
Advanced Concept Development-Munitions Health Monitoring-3	Next Generation Temperature/Humidity Sensor																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>

Schedule Details

Events	Start		End	
	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	4	2018	4	2021
Advanced Concept Development-Munitions Containerization-1A	1	2020	4	2021
Advanced Concept Development-Insensitive Munitions	1	2016	4	2017
Advanced Concept Development-Munitions Health Monitoring-3	3	2017	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EL7: Reduced Range Ammunition	-	3.429	7.609	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.038
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber Reduced Range Ammunition (RRA) technology applies to multiple calibers. As the technology matures in FY 2019, Program Element (PE) 0603639A, Project EL7, Reduced Range Ammunition for the 7.62mm variant transitions to PE 0604802A, Project EP3, Reduced Range Ammunition - Small Caliber. In FY 2020, the .50 Caliber variant will transition from PE 0603639A, Project EL7 to PE 0604802A, Project EP3.

A. Mission Description and Budget Item Justification

The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62mm 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 2020.

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

	FY 2018	FY 2019	FY 2020
Title: Technology Maturation and Risk Reduction (TMRR)	3.429	7.331	-
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.			
FY 2019 Plans: FY 2019 primary activities will focus on further assessment of .50 Cal prototypes including leveraging lessons learned from the USMC prototypes, Technology Readiness Level (TRL) 6 assessment, conducting System Readiness Review (SRR), preparation activities for Preliminary Design Review (PDR), preparing documentation for the .50 Milestone B, and preparing contract documentation for the Engineering and Manufacturing Development (EMD) contract.			
FY 2019 to FY 2020 Increase/Decrease Statement: Effort transitions from Program Element (PE) 0603639A, Project EL7 to PE 0604802A, Project EP3 in FY 2020.			
Title: FY 2019 SBIR / STTR Transfer	-	0.278	-
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 SBIR / STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	3.429	7.609	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EP3: <i>Reduced Range Ammunition - Small Caliber</i>	-	2.470	8.376	-	8.376	15.000	15.250	13.200	-	0.000	54.296

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

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 a competitive contract 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. After .50 Caliber Reduced Range Ammunition (RRA) MS B in FY 2020, the Government intends to award a competitive EMD contract.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

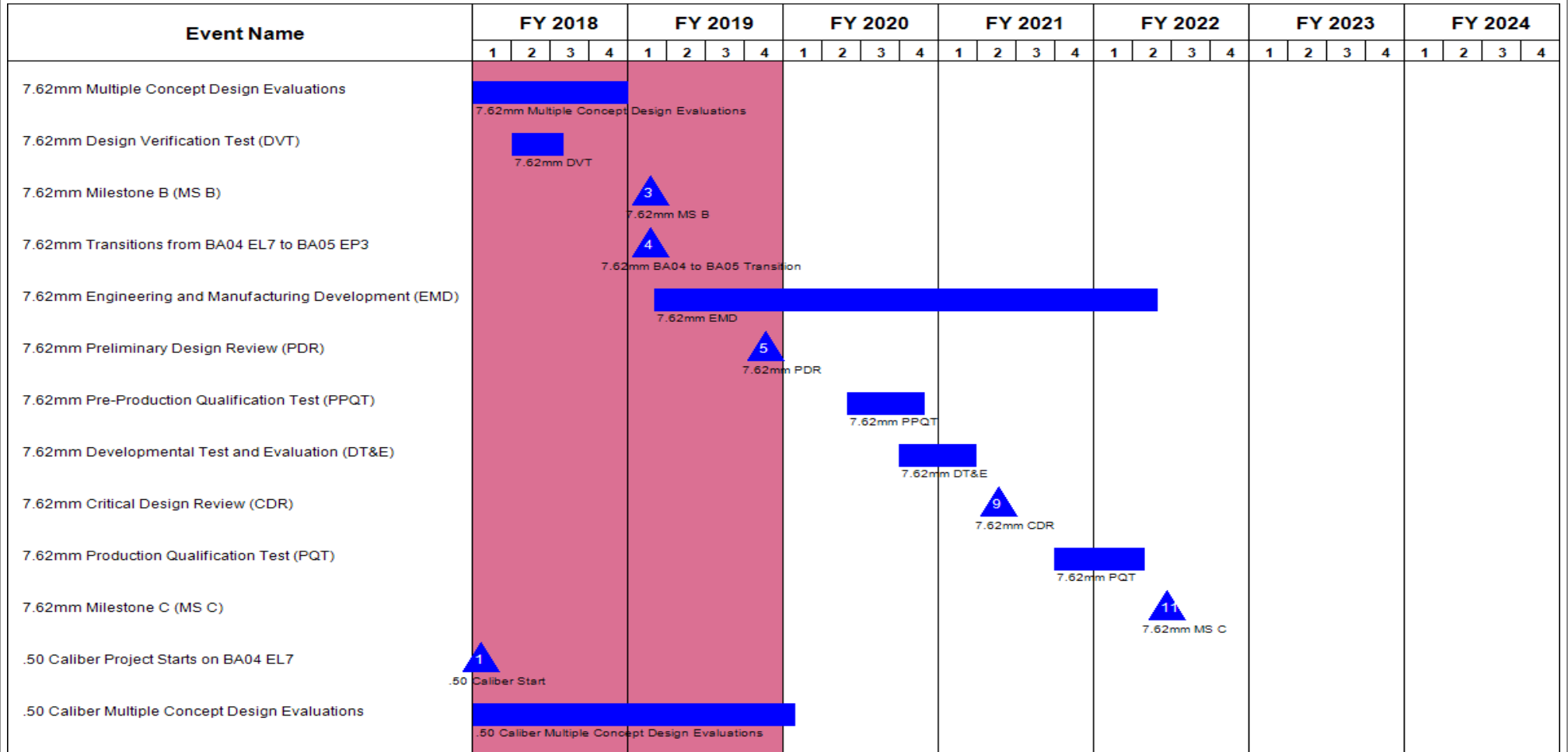
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EL7 / Reduced Range Ammunition
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	0.060	0.160	Oct 2017	-		-		-		-	0.000	0.220	-
Prototype	C/FFP	PTI : Clifton, NJ	0.157	-		-		-		-		-	0.000	0.157	-
Hardware	C/Various	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, New Jersey	0.112	-		-		-		-		-	0.000	0.112	-
Prototype Development	Option/ FFP	Booz Allen Hamilton : Dover, NJ	-	0.312	Dec 2017	-		-		-		-	0.000	0.312	-
Development Contract # 1	C/FFP	To Be Determined : To Be Determined	-	-		1.500	Jan 2019	-		-		-	0.000	1.500	-
Development Contract # 2	C/FFP	To Be Determined : To Be Determined	-	-		1.500	Jan 2019	-		-		-	0.000	1.500	-
Development Contract # 3	C/FFP	To Be Determined : To Be Determined	-	-		1.500	Jan 2019	-		-		-	0.000	1.500	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.278		-		-		-	0.000	0.278	-
Subtotal			0.329	0.472		4.778		-		-		-	0.000	5.579	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	0.666	2.467	Oct 2017	1.631	Oct 2018	-		-		-	0.000	4.764	-
Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	0.180	0.250	Mar 2018	0.800	Oct 2018	-		-		-	0.000	1.230	-
Subtotal			0.846	2.717		2.431		-		-		-	0.000	5.994	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
.50 Caliber Materiel Development Decision (MDD)	▲ 2																											
.50 Caliber Design Verification Test (DVT)					■																							
.50 Caliber Milestone B (MS B)									▲ 6																			
.50 Caliber Transitions from BA04 EL7 to BA05 EP3									▲ 7																			
.50 Caliber Engineering and Manufacturing Development (EMD)									■																			
.50 Caliber Preliminary Design Review (PDR)											▲ 8																	
.50 Caliber Pre-Production Qualification Test (PPQT)												■																
.50 Caliber Critical Design Review (CDR)															▲ 10													
.50 Caliber Production Qualification Test (PQT)																			■									
.50 Caliber Milestone C (MS C)																									▲ 12			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
7.62mm Multiple Concept Design Evaluations	1	2017	4	2018
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 Critical Design Review (CDR)	4	2021	4	2021
.50 Caliber Production Qualification Test (PQT)	1	2022	3	2022

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
.50 Caliber Milestone C (MS C)	2	2023	2	2023

Note
As the technology matures, the Reduced Range Ammunition (RRA) projects transition from Budget Activity 04 (BA04) PE 0603639A, Project EL7 to Budget Activity 05 (BA05) PE 0604802A, Project EP3.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EL8 / LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EL8: LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER	-	2.870	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.870
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The Lightweight Small Caliber Ammunition (LSCA) cartridge case technology will be applied to multiple calibers. The project involves developing and qualifying lightweight cartridge case, starting with 7.62mm ammunition, to replace current brass cartridge case. In FY 2019, Program Element (PE) 0603639A, Project EL8, Lightweight Cartridge Case for Small Caliber transitions to PE 0607131A, Project ER6, Direct Fire Technology.

A. Mission Description and Budget Item Justification

The Lightweight Small Caliber Ammunition (LSCA) Project is a critical technology development in response to the 7.62mm Capabilities Development Documents (CDD). The goal of the LSCA Project is to reduce the total Soldier load through reduction in ammunition weight. The LSCA Project will develop and field 7.62mm LSCA cartridges that will provide the same capabilities as the M80A1 and M62A1 cartridges. The LSCA cartridge will be designed to be compatible with all Army 7.62mm weapon systems, but optimized to work in the M240 Machine Gun. No funding requested in FY 2020.

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

	FY 2018	FY 2019	FY 2020
Title: 7.62mm Technology Maturation & Risk Reduction (TMRR) for Lightweight Small Caliber Ammunition (LSCA)	2.870	-	-
Description: Develop, demonstrate, and qualify a Lightweight Small Caliber Ammunition (LSCA) 7.62mm capability that will provide 10 to 50% ammunition weight savings.			
Accomplishments/Planned Programs Subtotals	2.870	-	-

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

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• ER6: Direct Fire Technology	8.354	12.591	8.525	-	8.525	5.729	6.592	6.413	2.989	Continuing	Continuing

Remarks

The funding lines continue work on the 7.62mm ammunition which transitions to Budget Activity 07, Program Element 0607131A, Project ER6, Direct Fire Technology in FY 2019.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL8 / <i>LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER</i>

D. Acquisition Strategy

Multiphase development contracts. Phase I and Phase II include development and evaluation of multiple designs/concepts. The Government intends to down-select to one design for Phase III in FY 2019 to manufacture test hardware to support Validation Testing planned for FY 2020. Low Rate Initial Production award will occur in FY 2021.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EL8 / LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER								
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost				
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	0.251	0.230	Oct 2017	-		-		-		-	0.000	0.481	Continuing	
Lightweight Case Phase 1 Development Contract	C/FFP	Orbital ATK : Missouri	0.636	-		-		-		-		-	0.000	0.636	Continuing	
Lightweight Case Phase 2 Development Contract	C/CPFF	PCP Ammunition : Vero Beach, FL	-	0.685	Sep 2018	-		-		-		-	0.000	0.685	Continuing	
Research	MIPR	United States Military Academy : New York	0.150	-		-		-		-		-	0.000	0.150	Continuing	
Phase 2 Case Development	C/FP	Nammo Talley : Mesa, Arizona	0.783	-		-		-		-		-	0.000	0.783	Continuing	
Modeling & Simulation	Option/CPFF	Concurrent Technologies Corporation (CTC) : New Jersey	0.261	0.180	Apr 2018	-		-		-		-	0.000	0.441	Continuing	
Lightweight Case Manufacturing Evaluation	SS/FP	Orbital ATK : Plymouth, Minnesota	0.316	-		-		-		-		-	0.000	0.316	Continuing	
Lightweight case manufacturing evaluation	SS/FFP	Northrop Grumman Innovation Systems : Independence, MO	-	0.016	Feb 2018	-		-		-		-	0.000	0.016	Continuing	
Lightweight ammunition links development	Option/CPFF	Northrop Grumman Innovation Systems : Independence, MO	-	0.309	Sep 2018	-		-		-		-	0.000	0.309	Continuing	
Subtotal			2.397	1.420		-		-		-		-	0.000	3.817	N/A	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost				
Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	0.660	1.375	Oct 2017	-		-		-		-	0.000	2.035	Continuing	

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) EL8 / LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			0.660	1.375		-		-		-		-	0.000	2.035	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
US Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	0.039	-		-		-		-		-	0.000	0.039	Continuing
Temperature testing	MIPR	Armament Research Development and Engineering Center : New Jersey	0.010	-		-		-		-		-	0.000	0.010	Continuing
Army Joint Munitions Command Testing	MIPR	Army Joint Munitions Command : Illinois	-	0.075	Jun 2018	-		-		-		-	0.000	0.075	Continuing
Subtotal			0.049	0.075		-		-		-		-	0.000	0.124	N/A
Project Cost Totals			3.106	2.870		0.000		-		-		-	0.000	5.976	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EL8 / LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
7.62mm Phase II	[Redacted]				[Redacted]																							
7.62mm Systems Requirement Review (SRR)	1				2																							
7.62mm Lightweight Ammo Transitions from BA04 EL8 to BA07 ER6					3																							
Down Select to 7.62mm Phase III					4																							
7.62mm Phase III					[Redacted]																							
7.62mm Preliminary Design Review (PDR)					5																							
7.62mm Preliminary Validation Testing									6																			
7.62mm Critical Design Review (CDR)									7																			
7.62mm Validation Testing													8															
7.62mm Limited User Evaluation (LUE)													9															
7.62mm Engineering Change Proposal																	10											
7.62mm Low Rate Initial Production (LRIP) Award																					11							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL8 / <i>LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
7.62mm Source Selection Evaluation	2	2017	4	2017
7.62mm Phase II	4	2017	4	2018
7.62mm Systems Requirement Review (SRR)	1	2018	1	2018
7.62mm Lightweight Ammo Transitions from BA04 EL8 to BA07 ER6	1	2019	1	2019
Down Select to 7.62mm Phase III	1	2019	1	2019
7.62mm Phase III	1	2019	2	2021
7.62mm Preliminary Design Review (PDR)	2	2019	2	2019
7.62mm Preliminary Validation Testing	4	2019	1	2020
7.62mm Critical Design Review (CDR)	3	2020	3	2020
7.62mm Validation Testing	1	2021	3	2021
7.62mm Limited User Evaluation (LUE)	1	2021	2	2021
7.62mm Engineering Change Proposal	3	2021	3	2021
7.62mm Low Rate Initial Production (LRIP) Award	4	2021	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EU3: .50 Caliber All-Purpose Tactical Cartridge (APTC)	-	0.000	0.000	4.250	-	4.250	0.000	0.000	0.000	0.000	0.000	4.250
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber All-Purpose Tactical Cartridge (APTC) Project is a new start in FY 2020. In FY 2021, the project will transition to Budget Activity 05 (BA05) 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 All-Purpose Tactical Cartridge (APTC) project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of All-Purpose Tactical Cartridge is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The All-Purpose Tactical Cartridge will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. FY 2020 funding supports Technology Maturation and Risk Reduction (TMRR) in preparation for a Technology Readiness Level (TRL) 6, conducting a Materiel Development Decision (MDD), and conducting Design Verification Tests.

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

	FY 2018	FY 2019	FY 2020
Title: Technology Maturation and Risk Reduction (TMRR)	-	-	4.250
Description: Develop, demonstrate, and qualify new .50 Caliber ammunition to replace and/or improve current legacy .50 Caliber variants.			
FY 2020 Plans: Build, evaluate, and refine .50 Caliber APTC concepts/prototypes and perform Milestone B preparation activities. Evaluate 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 2019 to FY 2020 Increase/Decrease Statement: Project is a new start beginning in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	4.250

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EU3 / <i>.50 Caliber All-Purpose Tactical Cartridge (APTC)</i>
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• EU5: <i>.50 Caliber All-Purpose Tactical cartridge (APTC)</i>	-	-	0.000	-	0.000	8.500	9.400	-	-	0.000	17.900

Remarks

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. PE 0604802A, Project EU5 .50 Caliber APTC. Funding continues the development work and supports Engineering and Manufacturing Development (EMD) beginning in FY 2021.

D. Acquisition Strategy

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

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EU3 / .50 Caliber All-Purpose Tactical Cartridge (APTC)								
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Prototype Development	C/CPPF	To be Determined : To be Determined	-	-		-		2.500	Jan 2020	-		2.500	Continuing	Continuing	Continuing	
Subtotal			-	-		-		2.500		-		2.500	Continuing	Continuing	N/A	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Armament Research Development and Engineering Center	MIPR	Armament Research Development and Engineering Center (ARDEC) : New Jersey	-	-		-		1.000	Oct 2019	-		1.000	Continuing	Continuing	Continuing	
Subtotal			-	-		-		1.000		-		1.000	Continuing	Continuing	N/A	
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Verification Testing	MIPR	Army Research Lab (ARL) : Maryland	-	-		-		0.750	Jan 2020	-		0.750	Continuing	Continuing	Continuing	
Subtotal			-	-		-		0.750		-		0.750	Continuing	Continuing	N/A	
Project Cost Totals			-	-		0.000		4.250		-		4.250	Continuing	Continuing	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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)

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
APTC Materiel Development Decision (MDD)									▲ 1 APTC MDD																			
APTC Advanced Concept Development																												
APTC Prototype Development & Evaluation																												
APTC Design Verification Test (DVT) 1																												
APTC Preliminary Design Review (PDR)																												
APTC Milestone B																												
APTC Transitions from BA04 EU3 to BA05 EU5																												
APTC Engineering & Manufacturing Development (EMD)																												
APTC Pre-Production Qualification Testing (PPQT)																												
APTC Critical Design Review (CDR)																												
APTC Design Verification Test (DVT) 2																												
APTC Production Qualification Testing (PQT)																												
APTC Milestone C (MS C)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EU3 / <i>.50 Caliber All-Purpose Tactical Cartridge (APTC)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
APTC Materiel Development Decision (MDD)	1	2020	1	2020
APTC Advanced Concept Development	1	2020	1	2021
APTC Prototype Development & Evaluation	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 Pre-Production Qualification Testing (PPQT)	4	2021	4	2021
APTC Critical Design Review (CDR)	2	2022	2	2022
APTC Design Verification Test (DVT) 2	2	2021	3	2021
APTC Production Qualification Testing (PQT)	3	2022	4	2022
APTC Milestone C (MS C)	1	2023	1	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FA5: Assured Precision Weapons and Munitions	-	12.480	14.322	31.267	-	31.267	29.907	31.000	31.000	25.000	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 Assured Precision Weapons and Munitions Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping that increase lethality and ensure future combat overmatch success of the Joint Force against peer/near-peer adversaries as well as improving 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 GPS coordinated efforts. The Assured Precision Weapons and Munitions Project directly supports Army Modernization Priorities 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 and Army's Assured PNT programs. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a system-of-systems environment, Army M-Code GPS technology integration and evaluation, and maturation of alternative positioning, navigation and timing related technologies to enable informed Assured PNT related program of record milestone and Army cross-functional modernization decisions.

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

	FY 2018	FY 2019	FY 2020
Title: Assured Precision Weapons and Munitions Integrated Product Support - Joint Lethality PNT SME WIPT & Program Management	2.380	2.255	3.574
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 2019 Plans: The subject matter experts will continue coordinating with and supporting the development and technology delivery activities of the Air Force's Military GPS User Equipment (MGUE) Program and the Army's Assured Positioning, Navigation and Timing (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 management of the evolving Joint Common GPS Specification and Interface Control Document for Precision Guided Munitions (PGMs). Specific support focus includes requirements for Military GPS User Equipment (MGUE) Increment 2 (aka Next Generation) and alternative Positioning, Navigation and Timing (PNT) technology maturity.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>The subject matter experts will continue coordinating with and supporting the development and technology delivery activities of the Air Force's Military GPS User Equipment (MGUE) program and the Army's Assured Positioning, Navigation and Timing (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 management of the evolving Joint Common GPS Specification and Interface Control Document for Precision Guided Munitions (PGMs). Specific support focus includes requirements for Military GPS User Equipment (MGUE) Increment 2 and alternative Positioning, Navigation and Timing (PNT) technology maturity.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to scope of work and ramp up of Military GPS User Equipment (MGUE) Increment 2 and alternative PNT related equities affecting the lethality community. Additional subject matter support (SME) support is required to initialize the framework and requirements for development of these Assured Positioning, Navigation and Timing (A-PNT) technologies to be demonstrated within Lethality Programs of Record (PoRs). Additional program management support required to manage increased project scope and funding starting in FY 2020.</p>				
<p>Title: Assured PNT related Integration Risk Mitigation - Implement Zero-Age-of-Data (ZAOD)</p> <p>Description: Mature and test Zero-Age-of-Data (ZAOD) for improved measurement accuracy of Network Assisted GPS data provided to Users.</p>		0.500	-	-
<p>Title: Assured PNT related Integration Risk Mitigation - A-PNT for Family of Scatterable Mines (FASCAM) Replacement</p> <p>Description: Evaluate, mature and test Assured-Position, Navigation, and Timing (A-PNT) system/subsystem components for terrain shaping enabling technologies.</p> <p>FY 2019 Plans: Initiate analysis and evaluation of various assured precision prototype technologies for future terrain shaping enabling technologies to support the program of record in their Analysis of Alternatives (AoA).</p> <p>FY 2020 Plans: Down-select assured precision technologies including alternative Positioning, Navigation and Timing (PNT) technologies for future terrain shaping Program of Record (PoR) communication capabilities through modeling and simulation based verification to initiate corresponding technology demonstrations.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		-	0.767	2.081

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Additional funding is required to support increasing level of work involved in evaluating and maturing Assured Positioning, Navigation and Timing (A-PNT) technologies for down selection.				
<p>Title: Assured PNT related Integration Risk Mitigation - Network Assisted A-PNT (NA2) for Weapons & Munitions Phase 1</p> <p>Description: Evaluate, mature and demonstrate technologies for modifying Network Assisted GPS (NA GPS) and associated data exchange that support Alternative Positioning, Navigation and Timing (PNT) and M-Code for Weapons and Munitions.</p> <p>FY 2019 Plans: Software development and test for an initial updated Network Assisted GPS prototype that incorporates Alternative Positioning, Navigation and Timing (PNT) and M-Code in Phase 1.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to Phase 1 of Network Assisted Assured-PNT (NA2) for Weapons and Munitions will be completed and technologies down selected for future implementation in Phase 2 upgrades.</p>		4.200	6.300	-
<p>Title: Assured PNT related Integration Risk Mitigation - NA2 for Weapons and Munitions Phase 2</p> <p>Description: Perform Network Assisted Assured-PNT (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 program of records. Inform future Navigational Warfare (NAVWAR) and alternative Positioning, Navigation and Timing (PNT) related weapons and munitions platform dependencies.</p> <p>FY 2020 Plans: Include 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. Perform Network Assisted Assured-PNT systems of systems capability integration and pre-system qualification integration risk reduction activities and finalize prototype software solutions.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Phase 2 of Network Assisted Assured-PNT for Weapons and Munitions begins in FY 2020 and will take two years. This effort builds upon the results and technology down-selects of Network Assisted Assured-PNT Phase 1.</p>		-	-	5.672
<p>Title: Assured PNT related Integration Risk Mitigation - NA2 for Guided Rocket/Missile Launcher Systems</p> <p>Description: Perform software development and prototyping activities to demonstrate Network Assisted Assured-PNT capability for Rocket/Missile artillery launcher systems. Integrate and demonstrate upgraded artillery launcher system into the Network Assisted Assured-PNT systems of systems networked capability to reduce subsequent program of record fielding risks.</p>		-	-	3.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>FY 2020 Plans: Conduct requirements refinement activities and initiate software development and prototyping activities to provide initial Network Assisted Assured-PNT (NA2) capability for Rocket/Missile artillery launcher systems. Initiate prototyping risk mitigation activities for Rocket/Missile artillery launcher systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort starts in FY 2020 and will take two years. Effort leverages results of Network Assisted Assured-PNT (NA2) Phase 1.</p>				
<p>Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for PGM Fuze Setter</p> <p>Description: Develop, prototype, and evaluate required emerging Assured-PNT technology enhancements to the Precision Guided Munition (PGM) Fuze Setter needed to enable continued performance Precision Guided Munitions in a realistic operational threat environment.</p> <p>FY 2019 Plans: Software development, integration and test for an upgraded Precision Guided Munition (PGM) Fuze Setter incorporates M-Code to enable continued performance of Precision Guided Munitions in a threat environment. Program transitions to program of record in FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Prototyping effort will be completed. Program transitions to program of record in FY 2020.</p>		3.500	2.137	-
<p>Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for Towed Howitzer Platforms</p> <p>Description: Prototype and evaluate Military GPS User Equipment (MGUE) Increment 1 (M-Code) GPS receiver cards in the M777A2 and M119A3 Towed Howitzer Platforms and evaluate technologies for providing Assured-PNT to Precision Guided Munitions.</p> <p>FY 2019 Plans: Update GPS receiver interfaces on fire platforms, integrate and test prototype Military GPS User Equipment (MGUE) Inc 1 cards interoperability, and assess corresponding performance impacts.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Demonstration of prototype Military GPS User Equipment (MGUE) Inc 1 cards in Towed Howitzer Platforms will be completed.</p>		1.100	0.472	-
<p>Title: Assured PNT related Weapons & Munitions Prototyping - Alternative Navigation Technologies (AltNav) Phase 1</p> <p>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.</p>		0.800	1.866	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
<p>FY 2019 Plans: Prototyping and evaluation of non-Global Positioning System Radio Frequency (Non-GPS RF) Navigation prototype systems in a modeling and simulation environment that can meet current navigation and timing requirements without access to GPS or in a GPS degraded environment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Initial Phase 1 demonstrations of non-Global Positioning System Radio Frequency (Non-GPS RF) in modeling and simulation environment will be completed.</p>				
<p>Title: Assured PNT related Weapons & Munitions Prototyping - AltNav Technologies (AltNav) Phase 2</p> <p>Description: Design and develop a prototype Alternative Navigation (AltNav) hardware and software capability for precision guided munition applications. 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.</p> <p>FY 2020 Plans: Design and develop an Alternative Navigation (AltNav) capable hardware and software prototype for Precision Guided Munition (PGM) applications to demonstrate and quantify AltNav performance. Perform integration efforts with the hardware and software prototype to conduct a ride-along performance evaluation of AltNav in a PGM environment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: AltNav Phase 2 begins in FY20 will take two years. This prototyping effort builds upon the modeling and simulation results of AltNav Phase 1.</p>		-	-	5.140
<p>Title: Assured PNT related Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)</p> <p>Description: Development and integration of prototype LADS to demonstrate an assured weapon survey capability within the M777A2 and M119A3 Howitzer Platforms.</p> <p>FY 2020 Plans: Development and integration of prototype LADS into the M777A2 and M119A3 Howitzer Platforms.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort begins in FY20.</p>		-	-	1.400
<p>Title: Army M-Code Technology Integration and Evaluation</p> <p>Description: Provide technical assessment, coordination, and engineering support related to the development, prototyping, integration, and evaluation of Air Force's Military GPS User Equipment (MGUE) technology deliverables across all Army</p>		-	-	9.200

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2020 Plans: Establish an Army M-Code GPS Weapons and Munitions Integrated Product Team (IPT). Initiate 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. Establish 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 PNT threat system-of-systems environment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort begins in FY20.</p>				
<p>Title: MGUE Inc 2 with PGK AJ</p> <p>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 Precision Guidance Kit - Anti Jam (PGK-AJ) to verify and validate needs and requirements are met by next generation MGUE.</p> <p>FY 2020 Plans: Finalize next generation Precision Guided Munition (PGM) Military GPS User Equipment (MGUE) technical requirements document for use by the MGUE program. Attend technical interchange meetings with MGUE vendors to influence MGUE designs to meet Precision Guided Munitions needs and requirements for next generation performance. Perform risk reduction analysis and activities of MGUE vendor designs.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020. FY 2020 is the fiscal year in which the Military GPS User Equipment (MGUE) developers will start significant design work to meet the requirements of the MGUE Precision Guided Munitions (PGM) technical requirements document.</p>		-	-	1.200
<p>Title: FY 2019 SBIR/STTR Transfer</p> <p>Description: FY 2019 SBIR/STTR Transfer</p>		-	0.525	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<i>FY 2019 Plans:</i> FY 2019 SBIR/STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR/STTR Transfer			
Accomplishments/Planned Programs Subtotals	12.480	14.322	31.267

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 the Defense Ordnance Technology Consortium (DOTC) Section 845 Other Transaction Authority (OTA) contract mechanism and In-House government development and engineering capabilities to obtain 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				FA5 / Assured Precision Weapons and Munitions							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	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	Dec 2017	3.585	Dec 2018	4.453	Dec 2019	-		4.453	Continuing	Continuing	Continuing
Assured PNT related Weapons Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	-	2.000	Dec 2017	2.000	Dec 2018	1.400	Dec 2019	-		1.400	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Risk Mitigation	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	-	2.500	Dec 2017	2.500	Dec 2018	4.700	Dec 2019	-		4.700	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	-	2.000	Dec 2017	2.000	Dec 2018	4.740	Dec 2019	-		4.740	Continuing	Continuing	Continuing
Army M-Code Technology Integration and Evaluation	MIPR	Various : Various	-	-		-		6.650	Dec 2019	-		6.650	Continuing	Continuing	Continuing
Subtotal			7.785	9.765		10.085		21.943		-		21.943	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	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	0.508	0.505	Dec 2017	1.180	Dec 2018	1.269	Dec 2019	-		1.269	Continuing	Continuing	Continuing
Assured Precision Weapons and Munitions IPT Support	MIPR	Various : Various	1.106	1.755	Dec 2017	1.075	Dec 2018	2.305	Dec 2019	-		2.305	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	0.380	0.455	Dec 2017	0.657	Dec 2018	1.200	Dec 2019	-		1.200	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Communication Electronics Research, Development and Engineering Center (CERDEC) : Aberdeen Proving Ground, MD	-	-		0.800	Dec 2018	0.800	Dec 2019	-		0.800	Continuing	Continuing	Continuing
Army M-Code Technology Integration and Evaluation Support	MIPR	Various : Various	-	-		-		2.550	Dec 2019	-		2.550	Continuing	Continuing	Continuing
MGUE Inc 2 for PGK AJ Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		-		1.200	Dec 2019	-		1.200	Continuing	Continuing	Continuing
FY 2019 SBIR/STTR Transfer	Various	Various : Various	-	-		0.525		-		-		-	Continuing	Continuing	Continuing
Subtotal			1.994	2.715		4.237		9.324		-		9.324	Continuing	Continuing	N/A
Remarks Program Management support increases by \$0.614 million due to increased project scope in FY 2020. Support consists of travel and other non-labor costs.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Integrated Product Support - Joint Lethality PNT SME WIPT & Pr	[Redacted]																											
Integration Risk Mitigation - Implement Zero-Age-of-Data (ZAOD	[Redacted]				[Redacted]																							
Integration Risk Mitigation - Family of Scatterable Mines (FASCAM) Replacement	[Redacted]				[Redacted]				[Redacted]																			
Integration Risk Mitigation - NA2 for Weapons & Munitions Phas	[Redacted]				[Redacted]				[Redacted]																			
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 2	[Redacted]				[Redacted]				[Redacted]				[Redacted]															
Integration Risk Mitigation - NA2 for Rocket/Missile Launcher	[Redacted]				[Redacted]				[Redacted]				[Redacted]															
Integration Risk Mitigation - Fire System-of-Systems APNT related C2 & AS	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]											
Integration Risk Mitigation - Next Generation PNT Technologies Phase 1	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]			
Weapons & Munitions Prototyping - APNT upgrades for PGM Fu	[Redacted]				[Redacted]				[Redacted]				[Redacted]															
Weapons & Munitions Prototyping - APNT upgrades for Towed H	[Redacted]				[Redacted]				[Redacted]				[Redacted]															
Weapons & Munitions Prototyping - Alternative Navigation Techn	[Redacted]				[Redacted]				[Redacted]				[Redacted]															
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 2	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]											
Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)	[Redacted]				[Redacted]				[Redacted]				[Redacted]															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Weapons & Munitions Prototyping - Next Generation PNT Technologies Phase 1																												
Army M-Code Technology Integration and Evaluation																												
MGUE INC 2 for PGK AJ																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

Schedule Details

Events	Start		End	
	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 - Fire System-of-Systems APNT related C2 & AS	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 PGK AJ	1	2020	4	2027

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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)			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FG1: Cannon-Delivered Area Effects Munitions (C-DAEM)	-	0.960	4.941	25.897	-	25.897	14.826	19.765	22.724	24.500	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2020 funding increase supports the Army's modernization priorities and development efforts to replace the current 155mm Dual Purpose Improved Conventional Munitions (DPICM) stockpile with DoD policy compliant munitions in support of the National Defense Strategy.

A. Mission Description and Budget Item Justification

The Cannon-Delivered Area Effects Munitions (C-DAEM) Project is a two increment approach to provide 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. The purpose of the C-DAEM AoA was to inform acquisition and investment decisions by the Army regarding replacement of the current stockpile of 155mm Dual Purpose Improved Conventional Munitions (DPICM) with DoD policy compliant munitions and address anti-armor and extended range capability requirements identified in the C-DAEM Initial Capabilities Document (ICD). The Army validated a two increment solution for C-DAEM. Increment I will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. Increment II will destroy personnel, materiel, air defense artillery and rocket launchers. Increment I and II will be developed simultaneously. FY 2020 resources will fund the competitive demonstrations for Increment I, as well as early detailed design testing supporting the qualification of Increment II to support the Army's modernization priorities in support of the National Defense Strategy.

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

	FY 2018	FY 2019	FY 2020
Title: C-DAEM Analysis of Alternatives (AoA), Capability Development Document (CDD), & Milestone A Support	0.960	1.960	-
Description: The purpose of the C-DAEM Alternatives of Analysis (AoA) was to inform acquisition and investment decisions by Army leadership to replace the current stockpile of 155mm Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense policy compliant munitions and address anti-armor and extended range capability requirements identified in the C-DAEM Initial Capabilities Document (ICD).			
FY 2019 Plans: FY 2019 supports the preparation and release of a Request for Proposals (RFP) for technologies and capabilities identified through the Analysis of Alternatives (AoA), as well as the development of the Capabilities Development Document (CDD) for each technology.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Decrease in funding due to achieved knowledge points of research and development efforts in support of C-DAEM Increments I and II.				
Title: C-DAEM Increment I		-	-	17.000
Description: C-DAEM Increment I will destroy infantry fighting vehicles, self-propelled howitzers, and tanks.				
FY 2020 Plans: FY 2020 will support a competitive demonstration phase to identify the most promising candidate(s) that address medium to heavy armored targets.				
FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funding in FY 2020 is based on the AoA and C-DAEM strategy per the April 2018 AROC decision for a two increment solution.				
Title: C-DAEM Increment II		-	2.800	8.897
Description: C-DAEM Increment II will destroy personnel, materiel, air defense artillery and rocket launchers.				
FY 2019 Plans: FY2019 funds will be used to purchase prototypes to support Increment II TMRR phase testing.				
FY 2020 Plans: FY 2020 funds will support the early design testing of candidates the Alternative of Analysis (AoA) had recommended addressing the personnel to medium armored target set.				
FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funding to cover Increment II prototype hardware and design testing.				
Title: FY 2019 SBIR / STTR Transfer		-	0.181	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer				
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer				
Accomplishments/Planned Programs Subtotals		0.960	4.941	25.897
C. Other Program Funding Summary (\$ in Millions)				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>
C. Other Program Funding Summary (\$ in Millions)		
Remarks In FY 2021, this Project will transition to Budget Activity 05, PE 0604802A Project FJ4, Cannon-Delivered Area Effects Munitions (C-DAEM). A Procurement Ammunition, Army C-DAEM funding line will be established in FY 2023.		
D. Acquisition Strategy C-DAEM will employ an evolutionary acquisition approach to efficiently transition the unique ammunition products as they become available. The Analysis of Alternatives (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. In FY 2019, C-DAEM is reducing risk by beginning prototype testing and evaluation in parallel to decomposing the AoA results into selection criteria. C-DAEM will use the selection criteria to sponsor a competitive demonstration for this first increment (medium to heavy armor) to streamline the acquisition process by leveraging Section 815 of the National Defense Authorization Act (NDAA) for FY 2016. C-DAEM will use the Defense Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) to commission the demonstration phase in FY 2020. For following increments to address personnel to medium armored targets, C-DAEM will use DOTC OTA to execute risk reduction testing in FY 2020 in parallel to the Increment I demonstrations. C-DAEM will then be in position to proceed to qualification testing of the next promising candidates to update plans for the next capability.		
E. Performance Metrics N/A		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	0.410	May 2018	0.935	Nov 2018	0.935	Nov 2019	-		0.935	Continuing	Continuing	Continuing
Subtotal			-	0.410		0.935		0.935		-		0.935	Continuing	Continuing	N/A

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

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Increment I TMRR Phase	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		-		17.000	Dec 2019	-		17.000	Continuing	Continuing	Continuing
Increment II Prototype Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-		2.400	Feb 2019	4.164	Dec 2019	-		4.164	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.181		-		-		-	0.000	0.181	-
Subtotal			-	-		2.581		21.164		-		21.164	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	MIPR	Armament Research Development Engineering Center	-	0.550	May 2018	1.025	Nov 2018	1.798	Oct 2019	-		1.798	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		(ARDEC) : Picatinny Arsenal, NJ													
Subtotal			-	0.550		1.025		1.798		-		1.798	Continuing	Continuing	N/A

Remarks
Additional Engineering Support required in FY 2020 in support of Increment I competitive demonstration and Increment II prototyping and design testing efforts.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Increment II Testing	MIPR	Army Test & Evaluation Command (ATEC) : Yuma, AZ	-	-		0.400	Feb 2019	2.000	Mar 2020	-		2.000	Continuing	Continuing	Continuing
Subtotal			-	-		0.400		2.000		-		2.000	Continuing	Continuing	N/A

			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	0.960		4.941		25.897		-		25.897	Continuing	Continuing	N/A

Remarks
Increment I will destroy infantry fighting vehicles, self-propelled howitzers, and tanks.
Increment II will destroy personnel, materiel, air defense artillery and rocket launchers.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				
	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	
Increment I Milestone A					▲ 1 MS-A																								
Increment I TMRR Competitive Demonstration / EMD																													
Increment I Preliminary Design Review (PDR)													▲ 2 PDR																
Increment I Milestone B																	▲ 5 MS-B												
Increment I Critical Design Review (CDR)																					▲ 7 CDR								
Increment I Milestone C																									▲ 9 MS-C				
Increment II Prototyping																													
Increment II Early Design Testing and Live Fire Demonstration																													
Increment II Preliminary Design Review (PDR)													▲ 3 PDR																
Increment II Milestone B																	▲ 4 MS-B												
Increment II Production Qualification Testing (PQT)																													
Increment II Critical Design Review (CDR)																					▲ 6 CDR								
Increment II Milestone C																									▲ 8 MS-C				

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Increment I Milestone A	1	2019	1	2019
Increment I TMRR Competitive Demonstration / EMD	1	2019	3	2024
Increment I Preliminary Design Review (PDR)	4	2020	4	2020
Increment I Milestone B	4	2021	4	2021
Increment I Critical Design Review (CDR)	2	2022	2	2022
Increment I Milestone C	4	2024	4	2024
Increment II Prototyping	2	2019	4	2019
Increment II Early Design Testing and Live Fire Demonstration	4	2019	4	2020
Increment II Preliminary Design Review (PDR)	4	2020	4	2020
Increment II Milestone B	1	2021	1	2021
Increment II Production Qualification Testing (PQT)	1	2021	1	2024
Increment II Critical Design Review (CDR)	2	2022	2	2022
Increment II Milestone C	2	2024	2	2024

Note

C-DAEM Increments I and II will be pursued simultaneously. Increment I will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. Increment II will destroy personnel, materiel, air defense artillery and rocket launchers.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
XT5: 30mm Anti-Personnel and Counter UAS	-	2.475	3.854	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.329
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 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 FY 2020.

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

	FY 2018	FY 2019	FY 2020
Title: Technology Maturation and Risk Reduction (TMRR)	2.475	3.730	-
Description: Demonstrating Technology Readiness Level 6 and achieving pre-Milestone (MS) B approval.			
FY 2019 Plans: FY 2019 activities include continuing activities to reduce risk and mature technology with a goal of a Technology Readiness Level 6 demonstration of the ability to select airburst or point detonating (PD) functionality when fired from a M230 ground mounted weapon system. Vendors will continue to develop the critical technologies to be designed and tested at the sub-system level for integration into the M789 round. The main effort in FY 2019 will focus on ammunition and system integration which will culminate with the demonstration of a proximity airburst round fired from a ground mounted weapon.			
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease in funding due to completion of Technology Maturation and Risk Reduction project in FY 2019.			
Title: FY 2019 SBIR / STTR Transfer	-	0.124	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	2.475	3.854	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) XT5 / <i>30mm Anti-Personnel and Counter UAS</i>

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 will occur via an Other Transaction Authority (OTA) award and a Technology Readiness Level (TRL) 6. The TMRR effort will consist of critical technology prototyping, testing, and demonstrating in the relevant environment.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
30mm Prototype Design	C/CPFF	General Dynamics : Marion, IL	-	2.475	Jul 2018	2.630	Jan 2019	-		-		-	0.000	5.105	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.124		-		-		-	0.000	0.124	-
Subtotal			-	2.475		2.754		-		-		-	0.000	5.229	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Armament Research, Development, and Engineering Center (ARDEC)	MIPR	Armament Research Development and Engineering Center (ARDEC) : Picatinny, NJ	-	-		0.350	Dec 2018	-		-		-	0.000	0.350	-
Subtotal			-	-		0.350		-		-		-	0.000	0.350	N/A


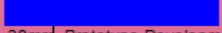

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test Readiness Level 6 (TRL6) Demonstration	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	-		0.750	Aug 2019	-		-		-	0.000	0.750	-
Subtotal			-	-		0.750		-		-		-	0.000	0.750	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	2.475	3.854	-	-	-	0.000	6.329	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) XT5 / <i>30mm Anti-Personnel and Counter UAS</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Technology Maturation and Risk Reduction (TMRR)	TMRR																											
Contract Award					 Contract Award																							
30mm Prototype Development					 30mm Prototype Development																							
Technology Readiness Level (TRL) 6 Demonstration									 TRL6 Demo																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) XT5 / <i>30mm Anti-Personnel and Counter UAS</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Technology Maturation and Risk Reduction (TMRR)	1	2018	4	2019
Contract Award	4	2018	4	2018
30mm Prototype Development	4	2018	4	2019
Technology Readiness Level (TRL) 6 Demonstration	4	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	41.431	84.297	157.656	-	157.656	151.624	172.864	50.703	44.700	0.000	703.275
<i>EV7: Combat Vehicle Prototyping</i>	-	41.431	84.297	157.656	-	157.656	151.624	172.864	50.703	44.700	0.000	703.275

A. Mission Description and Budget Item Justification

Next Generation Combat Vehicle (NGCV) Prototyping provides focused investment for the 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 to demonstrate new capabilities to meet emerging military needs, provide hardware for Soldier operational experiment/feedback, determine integration potential across the current Army portfolio of ground vehicles, and develop platform level prototypes. The primary efforts in this line include maturing and experimenting with Manned Un-Manned Teaming (in conjunction with Robotic Combat Vehicle) and maturing and experimenting with a variety of technologies that could potentially be added to the Optionally Manned Fighting Vehicle (OMFV) or legacy combat vehicles (such as Abrams and Bradley) in future incremental upgrades.

Prototyping allows for aggressive innovation (provides a bridge from S&T investment to vehicle integration and operational use), informs requirements through User Evaluations, ensures requirements are met, mitigates capability gaps and reduces integration risks. The strategy for NGCV will be to focus on delivering incremental experimental prototypes to the warfighter to demonstrate Manned Un-Manned Teaming (MUM-T) in conjunction with Robotic Combat Vehicles (RCV), to integrate technologies to maintain overmatch while demonstrating crew task reductions through crew augmentation enabled by optimized Warfighter Machine Interface (WMI) and sensor fusion.

Additionally, funding will support concept development, trade studies, technical/operational/affordability analyses to assess future concepts and designs for the Next Generation Tank (NGT). The analysis of these concepts will assist in targeting and maturing the correct S&T technologies to provide the next generation capabilities to the warfighter. This funding will also support the integration of a powertrain system in a high fidelity and realistic operating environment to buy back lost mobility due to increased combat vehicle platform weight. The effort will be focused on maturation of the engine and transmission for production. In addition, this funding will support technology maturation, integration risk reduction, and qualification of key lethality/weapon system and sensor technologies to support current and future increments of the Optionally Manned Fighting Vehicle (OMFV).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	32.739	119.395	64.986	-	64.986
Current President's Budget	41.431	84.297	157.656	-	157.656
Total Adjustments	8.692	-35.098	92.670	-	92.670
• Congressional General Reductions	-0.027	-0.098			
• Congressional Directed Reductions	-	-40.000			
• Congressional Rescissions	-	-			
• Congressional Adds	10.000	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.281	-			
• Adjustments to Budget Years	-	-	92.670	-	92.670

Change Summary Explanation

FY 2020 funding increase is to support experimental prototyping.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EV7: Combat Vehicle Prototyping	-	41.431	84.297	157.656	-	157.656	151.624	172.864	50.703	44.700	0.000	703.275
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

Next Generation Combat Vehicle Prototyping provides focused investment for the 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 to demonstrate new capabilities to meet emerging military needs, provide hardware for Soldier operational experiment/feedback, determine integration potential across the current Army portfolio of ground vehicles, and develop platform level prototypes. The primary efforts in this line include maturing and experimenting with Manned Un-Manned Teaming (in conjunction with Robotic Combat Vehicle) and maturing and experimenting with a variety of technologies that could potentially be added to the Optionally Manned Fighting Vehicle (OMFV) or legacy combat vehicles (such as Abrams and Bradley) in future incremental upgrades.

Prototyping allows for aggressive innovation (provides a bridge from S&T investment to vehicle integration and operational use), informs requirements through User Evaluations, ensures requirements are met, mitigates capability gaps and reduces integration risks. The strategy for NGCV will be to focus on delivering incremental experimental prototypes to the warfighter to demonstrate Manned Un-Manned Teaming (MUM-T) in conjunction with Robotic Combat Vehicles (RCV), to integrate technologies to maintain overmatch while demonstrating crew task reductions through crew augmentation enabled by optimized Warfighter Machine Interface (WMI) and sensor fusion.

Additionally, funding will support concept development, trade studies, technical/operational/affordability analyses to assess future concepts and designs for Next Generation Tank (NGT). The analysis of these concepts will assist in targeting and maturing the correct S&T technologies to provide the next generation capabilities to the war fighter. This funding will also support the integration of a powertrain system in a high fidelity and realistic operating environment to buy back lost mobility due to increased combat vehicle platform weight. The effort will be focused on maturation of the engine and transmission for production. In addition, this funding will support technology maturation, integration risk reduction, and qualification of key lethality/weapon system and sensor technologies to support current and future increments of the Optionally Manned Fighting Vehicle (OMFV).

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

	FY 2018	FY 2019	FY 2020
Title: Government Engineering & Program Management	14.854	18.760	9.550
Description: This effort conducts system level ground vehicle advanced concepting, prototyping and demonstration. This effort will partner government organic capabilities and Industry for an iterative process to develop combat vehicle concepts and			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>prototypes in order to inform and stabilize future capability requirements, performance characteristics, and affordability, evaluate and update operational concepts, and reduce future acquisition risk. Activity will include the integration and demonstration of a series of subsystem demonstrators building off of previous investment in ground combat acquisition and science and technology programs along with advanced technologies from Industry and Academia.</p> <p>FY 2019 Plans: Analyzed results of completed experimental demonstrations in support of next generation combat vehicles (both manned and autonomous) to include the Mission Enabling Technologies - Demonstrator (MET-D) demonstration of closed hatch Infantry Fighting Vehicle (IFV) and split-squad operations and applying lessons learned to mature the system level concepts and designs for integration of the S&T developed advanced ground vehicle subsystem technologies into a system level experimental prototype. Continued to conduct soldier-in-the-loop virtual simulations of future combat vehicle concepts to assess next generation capabilities and conduct system level performance trades. Analyzed system concepts and designs to identify long-lead hardware in preparation for procurement prior to system build and physical integration. Current prototype build by TARDEC will be accelerated for delivery by FY 2020. Initiated work on data fusion technology based on multiple sensor inputs for use in target identification and tracking, surveillance, and autonomous control.</p> <p>FY 2020 Plans: Will continue Government program management that will cover the costs of government and direct support contractor salaries, travel, training, supplies, equipment and facilities to manage the experimental prototyping program. This will also continue management of 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 transitions from the design to build phase and prepares for the test phase; and begins management of MET-D Phase II cost, schedule and performance during the design phase to enable long lead procurement.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program Management will decrease in FY 2020 due to the acceleration of the OMFV competition and shifting of program management costs to PE 0605625A.</p>			
<p>Title: Test & Evaluation</p> <p>Description: Test and Evaluation activities includes contractor and government testing as well as test documentation development. Contractor prove-out testing will be conducted using U.S. Army test facilities. Government development testing of prototype vehicles will evaluate vehicle performance and include user evaluation.</p> <p>FY 2019 Plans: Test & Evaluation included but not limited to safety, integration, and demonstration.</p> <p>FY 2020 Plans:</p>	7.981	8.000	2.480

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Will complete MET-D Phase I performance and user evaluation; gather and analyze all data; and develop and deliver final test report. Will further 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 FY 2021.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Test & Evaluation has decreased in FY 2020 due to acceleration of MET-D Phase I test and evaluation, which now begins in FY 2019.</p>				
<p>Title: Other Support Costs</p> <p>Description: Funding provided support software development, integration and support services, hardware, and vehicle electronics architecture subsystems.</p>		15.596	-	-
<p>Title: Modeling & Simulation</p> <p>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. Results provide the analytical underpinnings to support development of requirements.</p> <p>FY 2019 Plans: Continued to assess operational needs and operational employment through modeling and simulation by using the Maneuver Battle lab at Fort Benning and One Semi-Automated Forces (OneSAF) modeling. Modeling and simulation results will continue to support the development of requirements for future systems. The modeling and simulation outcomes coupled with planned technology proto-type demonstrations and user evaluations will provide the combat developer an analytical base to support the development and refinement of requirements.</p> <p>FY 2020 Plans: Will refine models utilized across ground vehicle platforms based on MET-D Phase I test results. Will update models with technologies identified for MET-D Phase II integration to conduct analysis prior to integration informing performance characteristics and identifying potential integration challenges. Will conduct performance and operational analysis with Manned Fighting Vehicle (MFV) Phase II models and Next Generation Tank (NGT) concepts to inform and stabilize capability requirements, performance characteristics, and operational concepts to reduce future acquisition risk.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Modeling & Simulation has increased in FY 2020 due to the start of Phase II modeling and simulation and Next Generation Tank concepting.</p>		3.000	1.834	4.360
<p>Title: Experimental Prototyping</p>		-	51.512	139.266

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>

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

Description: 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 in the S&T portfolio and public/private partnerships. This includes the development of the XM-913 and additional ammo needed for the development of lethality improvements. Experimentation of these platforms will help to inform requirements for the NGCV platform(s) and how they will operate, mitigate capability gaps, and reduce technology maturation and integration risks. The prototypes will also provide improved capabilities for command and control of the Robotic Combat Vehicle (RCV), demonstrating those capabilities through experimentation.

FY 2019 Plans:

TARDEC is using their existing OTA contract and accelerating the IFV build in order to deliver a first prototype by 1Q FY2021. The prototype is utilizing latest off-the shelf technologies and have the capability to upgrade to the Combat Vehicle Prototyping (CVP) technologies as they become available. Acceleration of the contract will require modification of the current contract.

NGCV Cross Functional Team (CFT)/PM is using the OTA to submit a call for white papers to Industry for concepts that will show technologies that will improve a combat vehicle (IFV or Tank) in the areas of mobility, survivability, lethality, situational awareness, sensor fusion and demonstrate a path to autonomy. The white papers will be used to award 1 to 2 contracts to build a prototype which will be delivered by 1Q FY2021. Information from the prototypes (both organic and from Industry), along with the parallel modeling and simulation will inform the development of the NGCV requirements.

Demonstrating Sensor Fusion/Crew Station requirements for manned and unmanned systems. Continuing to provide integration support and technology procurement for the software system integration laboratory (SIL). Providing integration support and user evaluation for the crew station SIL. These SILs will allow the integration team to simulate integrated system functionality prior to the actual physical integration of the system. Work performed in these SILs is critical to the successful mitigation of risk for the integrated systems experimentation by identifying any system integration-related errors as early as possible. Identifying errors early in the integration process will allow the team to develop solutions in a timely and effective manner. Continuing to mature the system level integration of the powerpack (engine, transmission, integrated starter generator, exhaust, air inlet, and thermal management system) along with working new projects in the areas of sensor fusion, which may include, but not limited to, data inputs from Global Positioning System (GPS), Light Detection and Raging (LIDAR), SOund Navigation And Ranging (SONAR), RAdio Detection And Ranging (RADAR), optical Infrared, UltraViolet (UV), etc. Procuring specialty tooling and long-lead items, and continuing to provide software support that is needed for system integration, for the accelerated experimentation.

FY 2020 Plans:

FY 2018	FY 2019	FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>The program will utilize an Other Transaction Agreement (OTA) mechanism in order to deliver the second phase of MET-D experimental prototypes in FY 2021. The MET-D Phase II efforts will continue system level prototype development and integration; maintain system level software; and develop software stability upgrades based on results from the MET-D Phase I Experimentation. The platform software upgrades will support integration of advanced technologies, improved Warfighter Machine Interface (WMI), and improvements for Robotic Combat Vehicle (RCV) command and control. Based on feedback from the Phase I Experiment, MET-D Phase II will also update 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 will also begin to build prototypes with increased capability provided from the next increment of S&T technological deliverables. The effort will begin 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 will continue the refinement and maturation of foundational architectures and technologies for power and mobility, lethality, protection, and situational awareness. The effort will conduct the development engineering effort for maturation and integration of technologies necessary to support Next Generation Combat Vehicles, such as powertrain and running gear, 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Experimental Prototyping has increased in FY 2020 due to the beginning of MET-D Phase II.</p>			
<p>Title: Powertrain Maturation</p> <p>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.</p> <p>FY 2020 Plans: Advanced Combat Engine efforts developed and delivered in FY19 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 2020, the focus will be on the manufacturability of the design which includes replacing expensive custom subcomponents against mass produced hardware. These efforts will lead to iterative engine prototypes that require performance testing to ensure they can achieve durability metrics</p>	-	-	2.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
while maintaining their performance capabilities. These will be the initial assessments for the reliability, maintainability, and logistical analyses necessary to transition to a vehicle platform.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Powertrain Maturation is a new requirement for FY 2020.			
<i>Title:</i> 2019 SBIR/STTR Transfer	-	4.191	-
<i>FY 2019 Plans:</i> FY 2019 SBIR/STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR/STTR transfer			
Accomplishments/Planned Programs Subtotals	41.431	84.297	157.656

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0605625A: <i>Manned Ground Vehicle</i>	-	-	378.400	-	378.400	320.100	218.700	65.700	52.300	0.000	1,035.200

Remarks

D. Acquisition Strategy

Next Generation Combat Vehicle (NGCV) prototyping provides focused investment for development of the combat vehicles in future battlefields. The purpose of this funding is to integrate the next generation of technology enabled capabilities developed in the Science and Technology (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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
NGCV Contract(s)	C/TBD	TBD : TBD	-	5.671	Jul 2018	31.188	Mar 2019	67.321	Mar 2020	-		67.321	Continuing	Continuing	Continuing
SCMM Phase 1	RO	CERDEC : TBD	-	1.233	Jul 2018	-		-		-		-	Continuing	Continuing	Continuing
Prototyping with Industry	C/Various	Various : Various	-	-		15.324	Jul 2019	71.945	Feb 2020	-		71.945	Continuing	Continuing	Continuing
Sensor Fuse/Crew/SIL	SS/TIA	TBD : TBD	-	10.000	Oct 2018	5.000	Jul 2019	-		-		-	0.000	15.000	-
Powertrain Maturation	C/TBD	TBD : TBD	-	-		-		2.000	Jul 2020	-		2.000	0.000	2.000	-
Subtotal			-	16.904		51.512		141.266		-		141.266	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PMO/PEO Support	MIPR	PM/PEO : Warren, MI	-	13.546	Dec 2018	18.760	Dec 2018	9.550	Dec 2019	-		9.550	0.000	41.856	-
2019 SBIR/STTR Transfer	TBD	ASA(ALT) : Washington, DC	-	-		4.191	Nov 2018	-		-		-	0.000	4.191	-
Subtotal			-	13.546		22.951		9.550		-		9.550	0.000	46.047	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SCMM User Evaluation	MIPR	Various : Various	-	7.981	Oct 2017	-		-		-		-	Continuing	Continuing	Continuing
Modeling & Simulation	Various	Various : Various	-	3.000	Jan 2018	1.834	Mar 2019	4.360	Mar 2020	-		4.360	Continuing	Continuing	Continuing
Developmental testing	MIPR	Various : Various	-	-		8.000	Jul 2019	2.480	Jul 2020	-		2.480	Continuing	Continuing	Continuing
Subtotal			-	10.981		9.834		6.840		-		6.840	Continuing	Continuing	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	41.431	84.297	157.656	-	157.656	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
FFV Phase I Extension (GDLS/BAE)	Fully funded (FFV Concept Designs (BAE/GDLS) and Demonstrator (GDLS))																											
Combat Vehicle Prototyping Technologies	Combat Vehicle Prototyping Technologies																											
SCMM Phase 1: Modified Bradley Fire Team IFV	SCMM Phase 1: Modified Bradley Fire Team IFV																											
Live Experiment					1 Live Experiment																							
Operational Modeling	Operational Modeling																											
Operational Modeling/O&O					Operational Modeling/O&O																							
Technologies Assessments and prioritization	Technologies Assessments and prioritization																											
MET-D Phase I Build					MET-D Phase Build																							
MET-D Phase I Test & Evaluation									MET-D Phase 1T&E																			
SCMM Experiment - Modified MOTS Demonstrators (6)	SCMM Experiment - Modified MOTS Demonstrators (6)																											
MAPS Hard Kill / Soft Kill Demo on Bradley	MAPS Hard Kill / Soft Kill Demo on Bradley																											
Powertrain Maturation									Powertrain Maturation																			
MET-D Phase 2 Design									MET-D Phase 2 Design																			

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
MET-D Phase 2 Build									[Bar: MET-D Phase 2 Build]																							
MET-D Phase II Test & Evaluation													[Bar: MET-D Phase 2 T&E]																			
MET-D Phase 3 Design																	[Bar: MET-D Phase 3 Design]															
MET-D Phase 3 Build																					[Bar: MET-D Phase 3 Build]											
MET-D Phase 3 Test & Evaluation																									[Bar: MET-D Phase 3 T&E]							
Next Generation Tank (NGT) Concepts																	[Bar: Next Generation Tank (NGT) Concepts]															

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603645A / <i>Armored System Modernization - Adv Dev</i>	Project (Number/Name) EV7 / <i>Combat Vehicle Prototyping</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
FFV Phase I Extension (GDLS/BAE)	1	2018	3	2018
Combat Vehicle Prototyping Technologies	1	2018	4	2019
SCMM Phase 1: Modified Bradley Fire Team IFV	1	2018	4	2018
Live Experiment	1	2019	1	2019
Operational Modeling	1	2018	4	2018
Operational Modeling/O&O	3	2019	4	2021
Technologies Assessments and prioritization	1	2018	4	2018
MET-D Phase I Build	2	2019	4	2019
MET-D Phase I Test & Evaluation	4	2019	2	2020
SCMM Experiment - Modified MOTS Demonstrators (6)	1	2018	4	2019
MAPS Hard Kill / Soft Kill Demo on Bradley	1	2018	4	2018
Powertrain Maturation	1	2020	4	2023
MET-D Phase 2 Design	1	2020	3	2020
MET-D Phase 2 Build	2	2020	1	2021
MET-D Phase II Test & Evaluation	1	2021	3	2021
MET-D Phase 3 Design	1	2020	4	2021
MET-D Phase 3 Build	4	2021	4	2022
MET-D Phase 3 Test & Evaluation	4	2022	2	2023
Next Generation Tank (NGT) Concepts	1	2020	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	15.759	11.735	6.514	3.000	9.514	9.042	9.020	9.812	10.252	0.000	75.134
610: Food Adv Development	-	6.286	4.593	3.721	-	3.721	3.223	3.175	3.972	4.133	0.000	29.103
C08: Rapid Equipping Force	-	9.043	5.796	2.793	3.000	5.793	5.819	5.845	5.840	6.119	0.000	44.255
EL1: Army Field Feeding Programs	-	0.430	1.346	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.776

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)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	13.157	11.746	7.402	-	7.402
Current President's Budget	15.759	11.735	6.514	3.000	9.514
Total Adjustments	2.602	-0.011	-0.888	3.000	2.112
• Congressional General Reductions	-0.007	-0.011			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	3.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.391	-			
• Adjustments to Budget Years	-	-	-0.888	3.000	2.112

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

Project: C08: Rapid Equipping Force

Congressional Add: Soldier Enhancement Program

	FY 2018	FY 2019
Congressional Add Subtotals for Project: C08	3.000	-
Congressional Add Totals for all Projects	3.000	-

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	
<u>Change Summary Explanation</u> Fiscal Year 2018 Congressional Add of \$3.000 Million for "Program Increase" applied to Project C08.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>				Project (Number/Name) 610 / <i>Food Adv Development</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
610: <i>Food Adv Development</i>	-	6.286	4.593	3.721	-	3.721	3.223	3.175	3.972	4.133	0.000	29.103
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Fielded Individual Ration Improvement Project (FIRIP)	0.641	-	-	-	-
Description: Continuous product improvement for the Meal, Ready to Eat (MRE) through the advanced development of novel nutrition, processing and packaging technologies to improve operational effectiveness and improve logistics.					
Title: Assault/Special Purpose Ration Improvement Project (ASPIP)	0.441	-	-	-	-
Description: Continuous product improvement of special purpose rations through the advanced development of novel nutrition, processing and packaging technologies to improve operational effectiveness and improve logistics. Special purpose rations include the Meal, Cold Weather (MCW), First Strike Ration (FSR), and Modular Operational Ration Enhancement (MORE).					
Title: Fielded Group Ration Improvement Project (FGRIP)	0.474	-	-	-	-
Description: Continuous product improvement to update/improve group ration components, menus, and packaging by integrating state-of-the-art military/commercial packaging and technology base transitions. The family of Unitized Group Rations (UGRs) includes the Unitized Group Ration - Heat & Serve (UGR-H&S), Unitized Group Ration - Express (UGR-E), Unitized Group Ration - A (UGR-A), and Unitized Group Ration - M (UGR-M).					
Title: US Navy Standard Core Menu (NSCM) Continuous Product Improvement Project	0.708	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>		Project (Number/Name) 610 / <i>Food Adv Development</i>	
B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<i>Description: Provide recommendations to the Naval Supply Systems Command (NAVSUP) for upgrading/improving Navy Standard Core Menu (NSCM) components by introducing new preparation techniques to enhance menu acceptance and effectiveness while reducing labor requirements.</i>					
<i>Title: Multi-Purpose Individual Heating Technology (MIT)</i>					
<i>Description: Develop a disposable, lightweight heating mechanism as a low-cost component of the Meal, Cold Weather (MCW) to facilitate MCW preparation in extreme environments with reduced resource requirements and increased ease of use.</i>					
	0.658	-	-	-	-
<i>Title: Joint Intuitive Multi-function Kitchen Equipment (JIMKE)</i>					
<i>Description: Reduce logistics burden associated with life cycle management of Navy (USN), Air Force (USAF) and Marine Corps (USMC) foodservice equipment. Integrate diagnostic technologies to predict maintenance, reduce labor associated with troubleshooting equipment in the field and increase mean time between failures (MTBF).</i>					
	0.724	-	-	-	-
<i>Title: Navy Galley and Scullery Upgrades</i>					
<i>Description: Continuously modernize foodservice operations by adding capabilities to provide optimized feeding, standardizing foodservice equipment assets fleet-wide, improving space utilization, and facilitating the continued use of the NSCM. Design, processes and equipment insertions will be implemented on legacy platforms during overhaul periods and during the new construction process on future vessels.</i>					
	0.670	-	-	-	-
<i>Title: Defense Logistics Agency (DLA)</i>					
<i>Description: Support management of the Department of Defense (DoD) Electronic Document Access (EDA) and Wide Area Workflow (WAWF) programs.</i>					
	0.548	-	-	-	-
<i>Title: Tray Ration Heater ? Improved (TRH-I)</i>					
<i>Description: Develop an updated and compact Tray Ration Heater to meet the requirements of the smaller, up-armored HMMWV cargo beds. Reduce the overall weight, improve man-portability, heat transfer efficiency, thermal storage efficiency, and reduce water consumption. Meet USMC-approved Statement of Need requirement for a Modernized Tray Ration Heat System.</i>					
	0.485	-	-	-	-
<i>Title: Inflatable Refrigerated Space (IRefS)</i>					
	0.609	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Develop a pallet sized, rapidly deployable, air deliverable field refrigeration system for safe storage of UGR-A rations to units located in austere environments with little to no ability to obtain rigid refrigerated containers.					
Title: Navy Mobile Feeding Galley Description: Develop a mobile feeding system for shore bases that is equipped with innovative cooking technology. The platform will have the capability to produce a rotating menu of fresh and healthy cuisine that will appeal to the millennial generation of sailors.	0.328	-	-	-	-
Title: Joint Service Combat Ration Advanced Development 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 PE 0603001A/Project C07 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 2019 Plans: Mature and integrate applied nutrition, food engineering, and food packaging innovations into individual and group ration platforms to increase operational effectiveness; identify suitable COTS/NDI candidate items to enhance warfighter acceptability, increase consumption and improve nutritional intake; conduct pilot scale in-house production to support engineering design, technology insertion, and commercial producibility; conduct accelerated storage studies to validate candidate components meet or exceed shelf-life requirements; develop test menus for warfighter evaluations; and transition validated prototypes to 6.5 for operational testing. Identify top-level system and end item user requirements for the developmental Close Combat Assault Ration (CCAR) to accelerate concepts for Test and Evaluation (T&E). FY 2020 Base 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	-	1.751	2.483	-	2.483

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
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 2019 to FY 2020 Increase/Decrease Statement: Change in funding supports development/acceleration of new CCAR prototypes. 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 2019 Plans: Conduct T&E of prototype equipment with diagnostic and predictive capabilities to decrease sustainment life-cycle costs and decrease equipment downtime; conduct design reviews and fabricate prototypes that improve the heating efficiency of rations while reducing overall weight, cube and total lifecycle costs; design and fabricate a rapidly deployable field refrigeration prototype to reduce resupply requirements to units in austere locations; test and evaluate new products and food preparation techniques to enhance menu acceptance and reduce labor requirements; and transition prototypes to PE 0604713A/Project 548 for System Development and Demonstration. FY 2020 Base 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 2019 to FY 2020 Increase/Decrease Statement: FY20 funds shifted to support the Army's modernization priorities in support of the National Defense Strategy.	-	2.674	1.238	-	1.238
Title: FY2019 SBIR/STTR Transfer Description: FY2019 SBIR/STTR Transfer	-	0.168	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<i>FY 2019 Plans:</i> FY2019 SBIR/STTR Transfer					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY2019 SBIR/STTR Transfer					
Accomplishments/Planned Programs Subtotals	6.286	4.593	3.721	-	3.721

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• 548: <i>Mil Subsistence Sys</i>	0.678	1.092	2.393	-	2.393	2.817	1.817	1.531	1.611	0.000	11.939

Remarks

D. Acquisition Strategy

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

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)						
2040 / 4				PE 0603747A / Soldier Support and Survivability					610 / Food Adv Development						
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Combat Feeding Program Management	Allot	RDECOM, NSRDEC, Natick, MA : Natick, MA	6.359	0.665	Oct 2017	0.468	Oct 2018	0.372	Oct 2019	-		0.372	Continuing	Continuing	Continuing
DLA Bill Pay	TBD	Various : Various	1.550	0.586	Oct 2017	-		-		-		-	0.000	2.136	-
Subtotal			7.909	1.251		0.468		0.372		-		0.372	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Service Rations and Combat Feeding Equipment	Various	Various : Various	30.501	4.500	Oct 2017	3.555	Oct 2018	3.349	Oct 2019	-		3.349	Continuing	Continuing	Continuing
FY2019 SBIR/STTR Transfer	TBD	TBD : TBD	-	-		0.168	Oct 2018	-		-		-	0.000	0.168	-
Subtotal			30.501	4.500		3.723		3.349		-		3.349	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Service Rations and Combat Feeding Equipment	Allot	RDECOM, NSRDEC, Natick, MA : Natick, MA	0.352	0.535	Oct 2017	0.402	Oct 2018	-		-		-	Continuing	Continuing	Continuing
Subtotal			0.352	0.535		0.402		-		-		-	Continuing	Continuing	N/A
Project Cost Totals			38.762	6.286		4.593		3.721		-		3.721	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Evaluate individual and group ration enhancements and transition to 6.5 for OT&E																												
Conduct in-house T&E of CCAR components, packaging and assembly formats																												
Conduct in-house T&E of optimized MRE and FSR w/ candidate CCAR components																												
Transition validated CCAR components and packaging to 6.5 for OT&E													▲															
Conduct in-house T&E of EGR and transition to 6.5 for OT&E																												
Provide USN w/CPI, evaluations and menu development to support transition to 6.5 for OT&E																												
ID and evaluate advanced galley/scullery equipment for the USN																												
Conduct Dem/Val of Galley/Scullery equipment and transition to 6.5 for OT&E																												
Conduct in-house T&E of JSERCS prototype for BEAR Type I kit for USAF																												
Identify and procure JIMKE prototypes																												
Conduct in-house T&E of JIMKE intuitive equipment and transition to SDD for OT&E																												
Conduct T&E on rapidly deployable refrigeration prototype																												
Award contract for build of prototype mobile galley feeding system																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Conduct in-house T&E of mobile feeding galley and transition to SDD for OT&E																												
Award contract to fabricate IRefS prototype and conduct in-house T&E																												
Conduct in-house T&E of energy conservation technologies for BEAR Kitchens																												
Conduct in-house T&E of EFK upgrades for USMC																												
Conduct in-house T&E of expeditionary kitchen systems for shore-based Navy units																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) 610 / <i>Food Adv Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Evaluate individual and group ration enhancements and transition to SDD for OT&E	1	2017	4	2024
Conduct in-house T&E of CCAR components, packaging and assembly formats	1	2019	4	2020
Conduct in-house T&E of optimized MRE and FSR w/ candidate CCAR components	1	2020	4	2020
Transition validated CCAR components and packaging to 6.5 for OT&E	4	2020	4	2020
Conduct in-house T&E of EGR and transition to 6.5 for OT&E	1	2020	4	2021
Provide USN w/CPI, evaluations and menu development to support NSCM upgrades	1	2017	4	2024
ID and evaluate advanced galley/scullery equipment for the USN	1	2017	4	2021
Conduct Dem/Val 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	2021
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	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>C08: Rapid Equipping Force</i>	-	9.043	5.796	2.793	3.000	5.793	5.819	5.845	5.840	6.119	0.000	44.255
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 2020 RDT&E request is \$2.793 million (Base) and \$3.000 million (OCO) and 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

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- 2. Movement and Maneuver
- 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. RDT&E funds maybe used to further develop high (>6) Technology Readiness Level (TRL) systems or advanced technologies in conjunction with industry and Other Governmental Agencies (OGAs). Frequently, these technologies only need small amounts of funding to help them achieve a maturity level that is suitable to solve deployed U.S. Army Forces 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Title: Rapid Equipping Force</p> <p>Description: Funding is provided for the following effort.</p> <p>FY 2019 Plans: The REF partners 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 OIR and other operations in the CENTCOM 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.</p>	6.043	5.706	2.793	3.000	5.793

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>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. In accordance with REF's participation in the Office of Secretary of Defense (OSD) led quick reaction capability effort, the Army determined the REF would provide the Army's warm base capability at ~600 requirements in FY19 and beyond.</p> <p>For FY19 the REF projects ~495 (Base/OCO) requirements in the following REF Warfighter function areas.</p> <ol style="list-style-type: none"> 1. Mission Command 2. Movement and Maneuver 3. Intelligence 4. Fires 5. Sustainment 6. Protection <p>The FY19 funds for projects in the amount of \$1.160 million (10% of Budget); breakout is base on the FY18 requirements trend.</p> <p>The REF anticipates ATEC testing and evaluation cost of \$4.546 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.</p> <p>FY 2020 Base Plans: The REF 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. In accordance with REF's participation in the Office of Secretary of Defense (OSD) led quick reaction capability</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>effort, the Army determined the REF would provide the Army's warm base capability at ~ 600 requirements in FY20 and beyond.</p> <p>REF Warfighter function areas</p> <ol style="list-style-type: none"> 1. Mission Command 2. Movement and Maneuver 3. Intelligence 4. Fires 5. Sustainment 6. Protection <p>For FY20 the REF projects ~600 (Base/OCO) requirements in the following REF Warfighter Functions.</p> <p>The FY20 funds for projects in the amount of \$279K (10% of Budget); breakout is based on the FY18 requirements trend.</p> <p>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.</p> <p>FY 2020 OCO Plans:</p> <p>The REF 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. In accordance with REF's participation in the Office of Secretary of Defense (OSD) led quick reaction capability</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>effort, the Army determined the REF would provide the Army's warm base capability at ~ 600 requirements in FY20 and beyond.</p> <p>REF Warfighter function areas</p> <ol style="list-style-type: none"> 1. Mission Command 2. Movement and Maneuver 3. Intelligence 4. Fires 5. Sustainment 6. Protection <p>For FY20 the REF projects ~600 (Base/OCO) requirements in the following REF Warfighter Functions.</p> <p>The FY20 funds for projects in the amount of \$300K (10% of Budget); breakout is base on the FY18 requirements trend.</p> <p>The REF anticipates ATEC testing and evaluation cost of \$2.700 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: There is no significant decrease (\$.006M).</p>					
<p>Title: FY 2019 SBIR / STTR Transfer</p> <p>Description: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>	-	0.090	-	-	-
Accomplishments/Planned Programs Subtotals	6.043	5.796	2.793	3.000	5.793

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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	FY 2018	FY 2019
Congressional Add: Soldier Enhancement Program	3.000	-
FY 2018 Accomplishments: Soldier Enhancement Program		
Congressional Adds Subtotals	3.000	-

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

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• M80101: <i>Rapid Equipping Soldier Support Equipment</i>	13.500	29.879	9.877	24.122	33.999	33.999	9.878	9.879	9.899	0.000	141.033

Remarks

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) developing emerging deployable capability 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Mission Command	C/FFP	Various : Various	0.100	0.091		0.116		0.019		0.021		0.040	0.000	0.347	-
Movement and Maneuver	C/FFP	Various : Various	0.198	0.150		0.192		0.049		0.053		0.102	0.000	0.642	-
Intelligence	C/FFP	Various : Various	0.080	0.208		0.267		0.077		0.083		0.160	0.000	0.715	-
Fires	C/FFP	Various : Various	0.007	0.003		0.004		0.002		0.002		0.004	0.000	0.018	-
Sustainment	C/FFP	Various : Various	0.093	0.144		0.184		0.034		0.037		0.071	0.000	0.492	-
Protection	C/FFP	Various : Various	0.186	0.308		0.487		0.098		0.104		0.202	0.000	1.183	-
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	-
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	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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			84.481	0.904		1.250		0.279		0.300		0.579	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ATEC (REF Integrated Priority List 1-10)	C/FFP	Various : Various	11.344	-		-		-		-		-	Continuing	Continuing	Continuing
ATEC (Warfighter Function Areas)	C/FFP	Various : Various	5.975	8.139		4.546		2.514		2.700		5.214	0.000	23.874	-
ATEC (REF Integrated Priority List 1-7)	C/FFP	Various : Various	2.000	-		-		-		-		-	0.000	2.000	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>

FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
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

Rapid Equipping Force																												
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) C08 / <i>Rapid Equipping Force</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Rapid Equipping Force	1	2020	1	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>				Project (Number/Name) EL1 / <i>Army Field Feeding Programs</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EL1: <i>Army Field Feeding Programs</i>	-	0.430	1.346	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.776
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Ethylene Control Device (ECD) for Multi Temperature Refrigerated Container System (MTRCS)	0.183	0.705	-	-	-
Description: Develop a compact, low power, automated system that decomposes ethylene inside the Multi Temperature Refrigerated Container Systems (MTRCS) to extend the shelf life of fresh fruits and vegetables. The 300 watt Ethylene Control Device (ECD) provides an average of two week shelf life extension of fresh produce. It can be operated independently or in unison with the MTRCS refrigeration system and can be temporarily or permanently mounted with no negative impact to the MTRCS storage capacity (MTRCS Operational Requirements Document (ORD) approved Apr 2002).					
FY 2019 Plans: Funds reallocated to Containerized Food Sanitation Center (CFSC) for prototype fabrication and testing.					
FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts will complete in FY19. Following FY 19, funding will shift to other accounts to support the Army's modernization priorities in support of the National Defense Strategy.					
Title: Deployable Sustainable Efficient Refrigeration Technology (DESERT)	0.247	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Description: Develop enhanced refrigeration unit that uses a lower Global Warming Potential (GWP) refrigerant than the current MTRCS. The Deployable Sustainable Efficient Refrigeration Technology (DESERT) makes use of R-134A as the working fluid. R-134A has a GWP of ~1300 as compared to the current MTRCS refrigerant R404A which has a GWP of ~3900. The redesigned refrigeration unit offers greater fuel efficiency, operation at real sun/desert temperatures of 135F, increased reliability and the ability to make use of alternate power sources to augment efficiency. The DESERT refrigeration unit shall be backwards compatible to the MTRCS for continuing procurement and as a replacement (MTRCS ORD approved Apr 2002).</p>					
<p>Title: Containerized Food Sanitation Center (CFSC)</p> <p>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..</p> <p>FY 2019 Plans: Complete prototype integration and conduct developmental testing and user evaluation. Complete program documentation for transition to production.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and funding will shift to other accounts to support the Army's modernization priorities in support of the National Defense Strategy.</p>	-	0.598	-	-	-
<p>Title: FY 2019 SBIR / STTR Transfer</p> <p>Description: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>	-	0.043	-	-	-
Accomplishments/Planned Programs Subtotals	0.430	1.346	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) EL1 / <i>Army Field Feeding Programs</i>

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

Line Item	FY 2018	FY 2019	FY 2020			FY 2021	FY 2022	FY 2023	FY 2024	Cost To	
			Base	OCO	Total					Complete	Total Cost
• EL2: <i>Army Field Feeding Equipment</i>	7.883	3.410	0.000	-	0.000	-	-	-	-	0.000	11.293
• M65806: <i>Assault Kitchen (AK)</i>	4.608	4.587	1.673	-	1.673	-	-	-	-	0.000	10.868
• M65801: <i>REFRIGERATED CONTAINER SYSTEMS</i>	10.877	9.140	0.000	-	0.000	-	-	-	-	0.000	20.017
• R62830: <i>Battlefield Kitchen (BK)</i>	-	2.024	0.000	-	0.000	-	-	-	-	0.000	2.024

Remarks

D. Acquisition Strategy

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

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) EL1 / <i>Army Field Feeding Programs</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support	Various	PMFSS : Natick, MA	0.349	0.128		0.190		-		-		-	0.000	0.667	-
Subtotal			0.349	0.128		0.190		-		-		-	0.000	0.667	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Battlefield Kitchen	Various	PMFSS : Natick, MA	2.632	-		-		-		-		-	0.000	2.632	-
ECD for MTRCS	Various	Various : Various	-	0.125		0.612		-		-		-	0.000	0.737	-
DESERT	Various	PMFSS : Natick, MA	-	0.177		-		-		-		-	0.000	0.177	-
FSC III	Various	Various : Various	-	-		0.501		-		-		-	0.000	0.501	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.043		-		-		-	0.000	0.043	-
Subtotal			2.632	0.302		1.156		-		-		-	0.000	4.090	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
	Project Cost Totals		2.981	0.430	1.346	-	-	-	0.000	4.757

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) EL1 / <i>Army Field Feeding Programs</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Conduct evaluation of ECD performance and application	█				█																							
Conduct in house CFSC design	█				█																							
Award contract for CFSC design					█																							
Fabricate CFSC test prototype and conduct testing					█																							
Transition CFSC to production					█																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603747A / <i>Soldier Support and Survivability</i>	Project (Number/Name) EL1 / <i>Army Field Feeding Programs</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Conduct evaluation of ECD performance and application	1	2018	4	2018
Conduct in house CFSC design	2	2018	3	2018
Award contract for CFSC design	4	2018	4	2018
Fabricate CFSC test prototype and conduct testing	1	2019	4	2019
Transition CFSC to production	4	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0603766A / Tactical Electronic Surveillance System - Adv Dev
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	27.733	35.667	34.890	-	34.890	26.257	29.299	31.285	33.987	Continuing	Continuing
907: Tactical Exploitation Of National Capabilities-MIP	-	27.733	35.667	34.890	-	34.890	26.257	29.299	31.285	33.987	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.

B. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	27.733	35.667	37.731	-	37.731
Current President's Budget	27.733	35.667	34.890	-	34.890
Total Adjustments	0.000	0.000	-2.841	-	-2.841
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-2.841	-	-2.841

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>				Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
907: <i>Tactical Exploitation Of National Capabilities-MIP</i>	-	27.733	35.667	34.890	-	34.890	26.257	29.299	31.285	33.987	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) 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.

FY 2020 Base funding in the amount of \$34.890 million provides: (1) 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, e.g. Information Store (iStore), Scalable User-Defined Real-time GEOINT Environment (SURGE), ADV Pilot, GETS-Cedalion Transition, MERIT project management and transition; (2) Advanced Miniaturized Data Acquisition System (AMDAS) 'Next' system development; (3) advanced development of more effective intelligence collection, processing, exploitation and dissemination (PED); (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.

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

	FY 2018	FY 2019	FY 2020
Title: TENCAP Cross-agency Core Engineering activities	15.836	10.594	13.605
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 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>	Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Continue 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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funds increase to support TENCAP engineering and management efforts that includes initial studies and designs, and progresses to prototype development and testing.</p>				
<p>Title: Air Vigilance - Advanced Development</p> <p>Description: Enhance intelligence, force protection, and indications and warning capabilities under Army TENCAP program.</p> <p>FY 2019 Plans: Continue to develop advanced signal and software enhancements for Air Vigilance (AV) Army Program of Record.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funds increase to support software changes required by capability drop requirements and newly identified and/or evolving threats.</p>		5.802	5.163	5.479
<p>Title: Advanced Miniaturized Data Acquisition System(AMDAS)/ AMDAS Dissemination Vehicle (ADV)</p> <p>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.</p> <p>FY 2019 Plans: AMDAS Next: 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.</p> <p>FY 2020 Plans:</p>		6.095	14.760	12.959

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>	Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funds decrease due to projected cost of the scope of work to be performed.</p>			
<p>Title: TENCAP Radio Frequency Exploitation (TRFE)</p> <p>Description: Prototype capability kit that informs, influences and enhances Terrestrial Layer Intelligence Support (TLIS) 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.</p> <p>FY 2019 Plans: Initial Development of TRFE cognitive software based Electronic Warfare and Cyber Attack prototype capability focused on countering Peer State and modern communication targets and threats.</p> <p>FY 2020 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funds decrease due to the projected scope of work for TENCAP Radio Frequency Exploitation (TRFE) advanced development and prototyping efforts.</p>	-	5.150	2.847
Accomplishments/Planned Programs Subtotals	27.733	35.667	34.890

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0605766A: <i>National Capabilities Integration (MIP)</i>	9.382	12.340	7.835	-	7.835	7.677	11.682	11.054	11.299	0.000	71.269
Remarks											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>	Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Intelligence Engineers (SETA)	C/FPAF	Perspecta : Alexandria, VA	18.531	4.200	Feb 2018	3.033	Jan 2019	3.100	Jan 2020	-		3.100	0.000	28.864	Continuing
Intelligence Engineers(Matrix Gov)	MIPR	AGC : Alexandria, VA	5.977	1.280	Jan 2018	1.300	Jan 2019	1.300	Jan 2020	-		1.300	0.000	9.857	Continuing
Subtotal			24.508	5.480		4.333		4.400		-		4.400	0.000	38.721	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TENCAP Core (Focus) Areas	Various	Multiple : Multiple	11.091	7.400	Jan 2018	3.103	Feb 2019	5.980	Feb 2020	-		5.980	0.000	27.574	Continuing
Air Vigilance	MIPR	Classified : MIPR	3.773	5.802	Jan 2018	5.163	Jan 2019	5.479	Jan 2020	-		5.479	0.000	20.217	Continuing
AMDAS/ADV	MIPR	Classified : MIPR	11.595	6.095	Jan 2018	14.760	Jan 2019	12.959	Jan 2020	-		12.959	0.000	45.409	Continuing
TRFE	MIPR	Classified : MIPR	-	-		5.150	Jan 2019	2.847	Jan 2020	-		2.847	0.000	7.997	Continuing
Subtotal			26.459	19.297		28.176		27.265		-		27.265	0.000	101.197	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Prgm Mgmt-Dir Gov,travel,etc.	Allot	Army TENCAP : Alexandria, VA	11.655	2.076	Jan 2018	2.258	Jan 2019	2.300	Jan 2020	-		2.300	0.000	18.289	Continuing
Secured Facilities	MIPR	Army Geospatial : Ft. Belvoir, VA	2.647	0.455	Jan 2018	0.475	Jan 2019	0.500	Jan 2020	-		0.500	0.000	4.077	Continuing
Subtotal			14.302	2.531		2.733		2.800		-		2.800	0.000	22.366	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>	Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
CORE Cross-Agency Advanced Development and Engineering	Development with Nat Intel Community																											
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY20-24 POM	▲1																											
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY21-25 POM					▲2																							
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY22-26 POM									▲3																			
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY23-27 POM													▲4															
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY24-28 POM																	▲5											
TENCAP General Officer Steering Group (TGOSG) - annual - guides FY25-29 POM																					▲6							
TENCAP General Officer Steering Group (TGOSG) - annual - informs POM FY26-30																									▲7			
ADV Advanced Development and Engineering	[Redacted]																											
AMDAS Next Studies/Antenna Design/Development	[Redacted]																											
AMDAS Next Ground Processor Development	[Redacted]																											
Air Vigilance Advanced Development and System prototype eff	[Redacted]																											
TRFE Prototype Development and System Integration Efforts	[Redacted]																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603766A / <i>Tactical Electronic Surveillance System - Adv Dev</i>	Project (Number/Name) 907 / <i>Tactical Exploitation Of National Capabilities-MIP</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
CORE Cross-Agency Advanced Development and Engineering	1	2018	4	2024
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 - informs POM FY26-30	2	2024	2	2024
ADV Advanced Development and Engineering	2	2015	4	2024
AMDAS Next Studies/Antenna Design/Development	1	2018	1	2024
AMDAS Next Ground Processor Development	2	2020	4	2024
Air Vigilance Advanced Development and System prototype efforts	3	2013	4	2024
TRFE Prototype Development and System Integration Efforts	1	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	501.816	7.341	251.011	-	251.011	10.340	10.450	9.602	9.378	Continuing	Continuing
BQ5: <i>Visual Augmentation System Advanced Development</i>	-	0.000	0.000	242.000	-	242.000	0.000	0.000	0.000	0.000	0.000	242.000
VT7: <i>Soldier Maneuver Sensors - Adv Dev</i>	-	501.816	7.341	7.528	-	7.528	7.573	7.683	7.602	7.378	Continuing	Continuing
VT8: <i>SOLDIER PRECISION TARGETING DEVICES - ADV DEV</i>	-	0.000	0.000	1.483	-	1.483	2.767	2.767	2.000	2.000	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 products to 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 multispectral sensors with smart processing will provide automatically adjusted weapon sight reticles and leverage network connectivity to enable improved situational awareness/understanding. Additional capabilities include signature management and resiliency across the electromagnetic spectrum, integration of a modular design structure for laser target acquisition applications including support for wireless data transfer, 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 associated costs for efforts associated with integration and interface of products on the Soldiers' head, body, and weapon. Funding in this project aligns with the Army's priorities in support of the National Defense Strategy.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>
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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/markings; 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	12.347	7.350	8.012	-	8.012
Current President's Budget	501.816	7.341	251.011	-	251.011
Total Adjustments	489.469	-0.009	242.999	-	242.999
• Congressional General Reductions	-0.009	-0.009			
• Congressional Directed Reductions	-1.400	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	491.300	-			
• SBIR/STTR Transfer	-0.422	-			
• Adjustments to Budget Years	-	-	242.999	-	242.999

Change Summary Explanation

FY 2018 increase begins the development of the Integrated Visual Augmentation System (IVAS) Heads Up Display (HUD) 3.0.
 FY 2020 increase is for improved Forward Looking Infrared (IFLIR) and IVAS HUD in support of the Army's modernization priorities.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>				Project (Number/Name) BQ5 / <i>Visual Augmentation System Advanced Development</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BQ5: <i>Visual Augmentation System Advanced Development</i>	-	0.000	0.000	242.000	-	242.000	0.000	0.000	0.000	0.000	0.000	242.000
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 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.

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

	FY 2018	FY 2019	FY 2020
Title: Heads Up Display (HUD)	-	-	242.000
Description: Integrated Visual Augmentation System (IVAS) HUD 3.0 provides a first generation single platform for Soldier/Marines to train, rehearse, and fight 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 2019 to FY 2020 Increase/Decrease Statement: FY2020 is the first year for IVAS in this project.			
Accomplishments/Planned Programs Subtotals	-	-	242.000

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

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• VT7: <i>Soldier Maneuver Sensors - Adv Dev</i>	501.816	7.341	7.528	-	7.528	7.573	7.683	7.602	7.378	0.000	546.921

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) BQ5 / <i>Visual Augmentation System Advanced Development</i>
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• BQ6: <i>Visual Augmentation System Eng Dev</i>	-	-	89.000	-	89.000	-	-	-	-	0.000	89.000
• L67: <i>Soldier Night Vision Devices</i>	108.518	58.987	40.060	-	40.060	28.667	19.240	20.646	25.310	0.000	301.428
• K36400: <i>Helmet Mounted Enhanced Vision Devices</i>	144.644	112.251	129.485	-	129.485	207.845	245.266	6.442	382.007	Continuing	Continuing
• K36402: <i>IVAS/Heads Up Display</i>	-	-	76.225	-	76.225	907.000	1,046.775	320.000	-	Continuing	Continuing

Remarks

D. Acquisition Strategy

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

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) BQ5 / <i>Visual Augmentation System Advanced Development</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Heads Up Display (HUD)	Various	Various : Various	-	-		-		232.534	Nov 2019	-		232.534	0.000	232.534	-
Subtotal			-	-		-		232.534		-		232.534	0.000	232.534	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Matrix Support	MIPR	NVESD : Fort Belvoir, Virginia 22060	-	-		-		9.466	Nov 2019	-		9.466	0.000	9.466	-
Subtotal			-	-		-		9.466		-		9.466	0.000	9.466	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	0.000	242.000	-	242.000	0.000	242.000	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.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) BQ5 / <i>Visual Augmentation System Advanced Development</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Heads Up Display (HUD)					Development																							
Technology improvements HUD 4.0									Development																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) BQ5 / <i>Visual Augmentation System Advanced Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Heads Up Display (HUD)	4	2018	4	2020
Technology improvements HUD 4.0	1	2021	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>				Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
VT7: <i>Soldier Maneuver Sensors - Adv Dev</i>	-	501.816	7.341	7.528	-	7.528	7.573	7.683	7.602	7.378	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project focuses on developing integrated and enhanced products to 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 multispectral sensors with smart processing will provide automatically adjusted weapon sight reticles and leverage network connectivity to enable improved situational awareness/understanding. Additional capabilities include signature management and resiliency across the electromagnetic spectrum, integration of a modular design structure for laser target acquisition applications including support for wireless data transfer, 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 associated costs for efforts associated with integration and interface of products into the Soldiers' Adaptive Architecture. Funding in this project aligns with Army's priorities in support of the National Defense Strategy.

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

	FY 2018	FY 2019	FY 2020
Title: Family of Vision and Mobility Capabilities (FVMC)	8.965	5.815	3.637
<p>Description: FVMC provides the next generation vision capabilities for day and night that will reduce Soldier's load and allow hands free operation. The FVMC will provide spatially-aligned imagery from the weapon sight to the heads-up display. FVMC supports Nett Warrior by fusing sensor video and data sources using smart processing to provide improved situational awareness/understanding in the Soldier vision system. The FVMC will provide day/night Rapid Target Acquisition capability by wirelessly interfacing with all variants of the Family of Weapon Sights. The FVMC will serve as the Soldier's digital platform for displaying augmented reality data. FVMC will integrate with future digital combat optics. FVMC provides capabilities that support overmatch against threats documented in the New Generation Warfare study, OSD Close Combat Strategic Portfolio Review and the Small Arms Ammunition Configuration study. These capabilities are captured in the Maneuver Force Modernization Strategy and Squad and Soldier Modernization Deep Dive strategic plans.</p> <p>FY 2019 Plans: In FY19, additional integration work will be performed for making an integral laser range finder work within the Lethality Smart System (LSS). In addition, the plan is to complete, establish and document, via Interface Control Documents (ICDs), the integration of the LSS with the Enhanced Night Vision Goggles, Integrated Visual Augmentation System and Next Generation</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Weapons. Some funding will go towards integration of more robust and less power micro Organic Light Emitting Diode Displays (OLEDs) that are used on essentially all Soldier Sensors and Lasers programs.</p> <p>FY 2020 Plans: For FY20, in addition to continuing unfinished work initiated in FY19, integration and enhancements are expected in the 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 SSL programs of record in an effort to establish a Intra Soldier Wireless (ISW) network. In FY20, the ISW network will be documented (via ICDs) and available for use on any program that desires wireless connectivity with the ISW network.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding decrease in FMVC is due to the development and maturation of components and algorithms required to support LSS programs.</p>			
<p>Title: Pre-Shot Threat Detection (PTD)</p> <p>Description: The PTD is a capability designed to detect threat Snipers, Forward Observers and Scouts equipped with direct view and indirect view optics. The PTD functions include laser illumination, optical augmentation and pointing. PTD functions will be integrated into other Soldier systems. PTD (Covert) provides the maneuver element with an enhanced solution (Covert) that provides the Soldier with a capability to conduct pre-shot threat detection by detecting and identifying the location of threat optics while remaining undetected.</p> <p>FY 2020 Plans: Continue development of covert components functionality.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: There is no funding planned for PTD in FY 2019.</p>	-	-	0.280
<p>Title: Family of Target Acquisition Laser (FTAL)</p> <p>Description: FTAL develops modular laser components and representative prototype systems to support target acquisition for pointing, ranging, target hand-off, detection and mitigation of threat sensors. FTAL 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. FTAL will also pursue a common remote to operate all weapon enablers. FTAL modules will be developed with full documentation, including specifications and interface control documents such that they support the Adaptive Soldier Architecture.</p> <p>FY 2019 Plans:</p>	1.551	1.257	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Initiate development and integration of modular target acquisition laser components.				
FY 2019 to FY 2020 Increase/Decrease Statement: A portion of FTAL funding transitioned to the Heads Up Display (HUD) in FY 2020.				
Title: Heads Up Display (HUD) Description: The Heads Up Display (HUD) is an output of the FVMC investment as a result of emerging commercial technology. The HUD will deliver overmatch warfighting capability plus enable Synthetic Training Environment squad capabilities. The HUD will also provide a single integrated digital, low profile, conformal day/night device that allows Soldiers and Squads to Train, Rehearse and Fight in any operational environment. Finally, prototyping will provide multiple knowledge point events to gauge vendor progress and capability to the force.		491.300	-	-
Title: Lethality Smart System (LSS) Description: The LSS is the next generation weapon targeting sensor for use on the Next Generation Squad Weapons (NGSW) which provides additional situational awareness and lethality by wirelessly interfacing to other Soldier devices. The increased LSS Soldier capabilities include providing heads up Rapid Target Acquisition (RTA) through the wireless interface with the head mounted Soldier vision systems and interface to the Next Generation Rifle through the Intelligent/Powered Rail. LSS will also interface wirelessly with the Nett Warrior End User Device (NW EUD) to exchange Mission Command information and provide through sight augmented reality for enhanced situational awareness. Additionally, LSS will provide day and night capabilities to image in multiple spectral bands, interrogate potential targets, provide facial recognition capabilities at tactical ranges, perform target handoff, provide distance to target through laser rangefinder interface, and calculate and adjust for displaced reticule using advanced fire control algorithms. FY 2020 Plans: Within the Pre-Shot Detection and Family of Target Acquisition Laser lines, FY 2019 should complete the development of laser components including the "ATOM" Short Wave Infra-Red (SWIR) laser that is planned for incorporation into the LSS. The ATOM lasers primarily used for aiming, target handoff, target illumination and ranging. FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding increased due to the development and maturation of components and algorithms required to support LSS.		-	-	3.611
Title: FY 2019 SBIR / STTR Transfer Description: FY 2019 SBIR / STTR adjustment. FY 2019 Plans:		-	0.269	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 SBIR / STTR adjustment.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR / STTR adjustment.			
Accomplishments/Planned Programs Subtotals	501.816	7.341	7.528

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• L67: <i>Soldier Night Vision Devices</i>	108.518	58.987	40.060	-	40.060	28.667	19.240	20.646	25.310	Continuing	Continuing
• K36400: <i>Helmet Mounted Enhanced Vision Devices</i>	144.644	112.251	129.485	-	129.485	207.845	245.266	6.442	382.007	Continuing	Continuing
• K22002: <i>FWS-INDIVIDUAL</i>	59.105	94.932	81.541	-	81.541	70.211	61.922	71.600	77.797	Continuing	Continuing
• K22003: <i>FWS-CREW SERVED</i>	-	31.106	39.342	-	39.342	85.949	85.002	85.647	77.306	Continuing	Continuing
• K22004: <i>FWS-SNIPER</i>	-	-	0.000	-	0.000	2.571	11.348	18.862	19.787	Continuing	Continuing
• B53800: <i>Laser Target Locator Systems</i>	37.975	32.704	24.354	-	24.354	13.913	20.839	23.773	24.182	Continuing	Continuing
• K35110: <i>Small Tactical Optical Rifle Mounted MLRF</i>	16.157	21.238	22.623	-	22.623	10.607	21.377	26.087	31.845	Continuing	Continuing
• BQ5: <i>Visual Augmentation System Advanced Development</i>	-	-	242.000	-	242.000	-	-	-	-	0.000	242.000
• BQ6: <i>Visual Augmentation System Eng Dev</i>	-	-	89.000	-	89.000	-	-	-	-	0.000	89.000
• K36402: <i>IVAS/Heads Up Display</i>	-	-	76.225	-	76.225	907.000	1,046.775	320.000	-	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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management	MIPR	Various : Various	5.083	15.912	Nov 2017	0.383	Nov 2018	0.394	Nov 2019	-		0.394	Continuing	Continuing	-
Subtotal			5.083	15.912		0.383		0.394		-		0.394	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Family of Vision and Mobility Capabilities (FVMC)	MIPR	NVESD : FT BELVOIR, VA	6.511	8.301	Dec 2017	5.048	Dec 2018	3.397	Nov 2019	-		3.397	Continuing	Continuing	-
Pre-Shot Threat Detection (PTD)	MIPR	NVESD : FT BELVOIR, VA	7.543	-		-		0.280	Nov 2019	-		0.280	Continuing	Continuing	-
Family of Target Acquisition Laser (FTAL)	MIPR	NVESD : FT BELVOIR, VA	-	1.458		0.999	Jan 2019	-		-		-	Continuing	Continuing	-
Heads Up Display (HUD)	Various	Various : Various	-	461.235	Sep 2018	-		-		-		-	Continuing	Continuing	-
Lethality Smart System (LSS)	TBD	TBD : TBD	-	-		-		2.797	Nov 2019	-		2.797	Continuing	Continuing	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.269		-		-		-	Continuing	Continuing	-
Subtotal			14.054	470.994		6.316		6.474		-		6.474	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Matrix Support	MIPR	NVESD : FT BELVOIR, VA	1.887	9.220	Nov 2017	0.642	Nov 2018	0.660	Nov 2019	-		0.660	Continuing	Continuing	-
Subtotal			1.887	9.220		0.642		0.660		-		0.660	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Support Test Activity	MIPR	Army Test and Evaluation Command : Various	0.600	5.690	Apr 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			0.600	5.690		-		-		-		-	Continuing	Continuing	N/A
Project Cost Totals			21.624	501.816		7.341		7.528		-		7.528	Continuing	Continuing	N/A

Remarks
 FY 2018 increase begins the development of the Integrated Visual Augmentation System (IVAS) Heads Up Display (HUD) 3.0.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Lethality Smart System (LSS) MS A									1 MS A																							
Family of Target Acquisition Laser (FTAL)									Development				Development																			
Lethality Smart System (LSS)																																
Heads Up Display (HUD)									Development				Development																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT7 / <i>Soldier Maneuver Sensors - Adv Dev</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Lethality Smart System (LSS) MS A	1	2020	1	2020
Family of Target Acquisition Laser (FTAL)	1	2019	4	2023
Lethality Smart System (LSS)	1	2019	4	2024
Heads Up Display (HUD)	4	2018	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>				Project (Number/Name) VT8 / <i>SOLDIER PRECISION TARGETING DEVICES - ADV DEV</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
VT8: <i>SOLDIER PRECISION TARGETING DEVICES - ADV DEV</i>	-	0.000	0.000	1.483	-	1.483	2.767	2.767	2.000	2.000	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/markings; 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 2018	FY 2019	FY 2020
Title: Precision Pointing and Navigation Component Development	-	-	1.483
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 2019 to FY 2020 Increase/Decrease Statement: This increase is due to FY 2020 being the first year that the VT8/Soldier Precision Targeting Devices - Advanced Development is funded.			
Accomplishments/Planned Programs Subtotals	-	-	1.483

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>	Project (Number/Name) VT8 / <i>SOLDIER PRECISION TARGETING DEVICES - ADV DEV</i>

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

Line Item	FY 2018	FY 2019	FY 2020	FY 2020	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Cost To	Total Cost
			Base	OCO	Total					Complete	
• L76: <i>Dismounted Fire Support Laser Targeting Systems</i>	14.366	15.322	5.836	-	5.836	5.249	5.452	4.878	5.480	0.000	56.583
• L79: <i>Joint Effects Targeting Systems (JETS)</i>	7.824	10.463	7.810	-	7.810	5.571	5.608	5.040	5.609	0.000	47.925
• K32101: <i>JOINT EFFECTS TARGETING SYSTEM (JETS)</i>	38.664	66.574	69.720	-	69.720	69.714	69.707	69.701	69.694	0.000	453.774
• K32307: <i>LLDR 3</i>	-	-	0.000	-	0.000	31.364	54.425	59.123	61.841	Continuing	Continuing
• KA3100: <i>Mod Of In- Svc Equip (LLDR)</i>	9.172	24.833	6.044	-	6.044	-	-	-	-	0.000	40.049

Remarks

D. Acquisition Strategy

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

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603774A / Night Vision Systems Advanced Development				VT8 / SOLDIER PRECISION TARGETING DEVICES - ADV DEV							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	PM SSL : Ft. Belvoir, VA 22060	-	-		-		0.023	Nov 2019	-		0.023	Continuing	Continuing	-
Subtotal			-	-		-		0.023		-		0.023	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Precision Pointing and Navigation	C/FFP	Various : Various	-	-		-		1.439	Dec 2019	-		1.439	Continuing	Continuing	-
Subtotal			-	-		-		1.439		-		1.439	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Matrix Support	MIPR	NVESD : Ft. Belvoir, VA 22060	-	-		-		0.021	Nov 2019	-		0.021	Continuing	Continuing	-
Subtotal			-	-		-		0.021		-		0.021	Continuing	Continuing	N/A
Project Cost Totals			-	-		0.000		1.483		-		1.483	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems Advanced Development</i>		Project (Number/Name) VT8 / <i>SOLDIER PRECISION TARGETING DEVICES - ADV DEV</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Future Dismounted Fire Support Development																												
Precision Pointing and Navigation Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603774A / <i>Night Vision Systems</i> <i>Advanced Development</i>	Project (Number/Name) VT8 / <i>SOLDIER PRECISION TARGETING</i> <i>DEVICES - ADV DEV</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Future Dismounted Fire Support Development	3	2020	4	2024
Precision Pointing and Navigation Development	3	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	15.039	14.731	15.132	-	15.132	16.263	15.324	14.933	13.944	0.000	105.366
035: National Defense Cntr For Enviro Excellence	-	3.628	4.864	5.121	-	5.121	5.205	5.327	6.455	6.587	0.000	37.187
E21: Environmental Quality Technology Dem/Val	-	11.411	9.867	10.011	-	10.011	11.058	9.997	8.478	7.357	0.000	68.179

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)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	10.456	14.749	14.979	-	14.979
Current President's Budget	15.039	14.731	15.132	-	15.132
Total Adjustments	4.583	-0.018	0.153	-	0.153
• Congressional General Reductions	-0.008	-0.018			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	5.000	-			
• SBIR/STTR Transfer	-0.409	-			
• Adjustments to Budget Years	-	-	0.153	-	0.153

Change Summary Explanation

FY2018 reprogramming increase of \$5.000 Million supports Explosive Ordnance Disposal (Project E21).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>				Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
035: <i>National Defense Cntr For Enviro Excellence</i>	-	3.628	4.864	5.121	-	5.121	5.205	5.327	6.455	6.587	0.000	37.187
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 2018	FY 2019	FY 2020
Title: Conduct demonstration/validation of environmentally acceptable technologies that enhance military readiness and reduce production, operating, and/or disposal costs.	3.588	4.593	5.021
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 2019 Plans: The NDCEE Program Management Office (PMO) is on-boarding eight new projects for the FY 2019 funding cycle, including Autonomous Robotic and Remote Refueling Point for Rotary Wing Aircraft, Green Machining of Multi-Service Weapons by 3D			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Waterjet, Novel Bioaugmented Sorption Treatment Technology for CVOCs and 1,4 Dioxane, Environmentally Compliant Inorganic Mat?ls for Corrosion & Wear Protection of Structural Metals on Military Aircraft & Weapon Systems, Navy Safety Certification of Lithium-ion 6T batteries for Grounds Vehicle Use and Surface Ship Transport, Energy Efficient Expeditionary Small Unit Water Purifier, Visual Indicator for Hydrogen Fluoride Produced from Extinguishing Fires with Hydrofluorocarbons, and Lightweight Power for Warfighter Expeditionary Non-resupply Missions. Additional funds are being distributed to continue nine projects that were initiated in FY 2017 - 2018.</p> <p>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 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funding to support project selection process for potential FY 2021 new starts.</p>				
<p>Title: NDCEE Government program management during contract negotiations and during project formulation, execution, and technology transfer.</p> <p>Description: Funds the NDCEE Government program management during comprehensive NDCEE lifecycle, including project cultivation and identification, screening, selection, execution, and technology transition.</p> <p>FY 2019 Plans: Provide comprehensive day-to-day management of the NDCEE, including project cultivation, identification, screening, financial oversight, funding distribution, and execution reporting. Funding the Army Contracting Command at Aberdeen Proving Ground to support NDCEE contract closeouts. PMO staff is traveling to project demonstration sites, as appropriate.</p> <p>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.</p>		0.040	0.100	0.100
<p>Title: FY2019 SBIR/STTR Transfer</p> <p>Description: FY 2019 SBIR/STTR Transfer</p> <p>FY 2019 Plans:</p>		-	0.171	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 SBIR/STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR/STTR Transfer			
Accomplishments/Planned Programs Subtotals	3.628	4.864	5.121

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support	MIPR	AEC : San Antonio, TX	24.876	0.040		0.100	Nov 2018	0.100	Nov 2018	-		0.100	Continuing	Continuing	Continuing
Subtotal			24.876	0.040		0.100		0.100		-		0.100	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FY2019 SBIR/STTR Transfer	TBD	TBD : TBD	-	-		0.171		-		-		-	0.000	0.171	-
Subtotal			-	-		0.171		-		-		-	0.000	0.171	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development Testing and Evaluation	Various	Various. : Various	32.036	3.588		4.593	Nov 2018	5.021	Nov 2018	-		5.021	Continuing	Continuing	Continuing
Subtotal			32.036	3.588		4.593		5.021		-		5.021	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
	Project Cost Totals		56.912	3.628	4.864	5.121	-	5.121	Continuing	Continuing

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
NDCEE Management and Operations (Enduring)																												
NDCEE Env, Safety, Occ Health, and Energy Technology Dem/Val (Enduring)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) 035 / <i>National Defense Cntr For Enviro Excellence</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>				Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
E21: <i>Environmental Quality Technology Dem/Val</i>	-	11.411	9.867	10.011	-	10.011	11.058	9.997	8.478	7.357	0.000	68.179
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 2018	FY 2019	FY 2020
Title: Environmental quality technology demonstration and validation: Toxic Metal Reduction in Surface Finishing of Army Weapon Systems (RDECOM)	2.391	2.954	3.102
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 2019 Plans: Demonstrate hexavalent chromium-free anodizing process on aluminum aircraft parts; establish test bed for cold spray repair of hard chrome-plated wear surfaces during depot maintenance; qualify hexavalent chromium-free alternatives for sealing heavy zinc phosphate surfaces on steel weapon systems.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
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 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to economic adjustment.				
Title: Environmental quality technology demonstration and validation: Airborne Lead Reduction from Army Weapon Systems (RDECOM) 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 2019 Plans: Demonstrate lead-free primary explosive composition in stab detonator and electric detonator configurations; establish pilot-scale production of lead-free percussion primers and conduct first article testing in hand held signals. 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 2019 to FY 2020 Increase/Decrease Statement: Funding change due to economic adjustment.		1.273	1.837	2.727
Title: Environmental quality technology demonstration and validation: Low Global Warming Potential (LGWP) Alternatives to Ozone Depleting Substances (ODS) (RDECOM) 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 2019 Plans:		-	0.250	0.222

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Demonstrate new test method suitable for classifying the flammability of refrigerants facing realistic current and future force threats.</p> <p>FY 2020 Plans: Will validate and promulgate the demonstrated refrigerant flammability test method.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding change due to economic adjustment.</p>				
<p>Title: Environmental quality technology demonstration and validation: ESOH Impacts of Short-Term Noise Assessment Procedures</p> <p>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.</p> <p>FY 2019 Plans: Provide a report that summarizes all results of the demonstration and validation study. Validation report will document assessment accuracy across a range of environmental conditions and assessment consistency across user applications.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort ends in FY 2019</p>		0.625	0.250	-
<p>Title: Environmental quality technology demonstration and validation: Advanced Water Reuse Technology for Fixed Installations</p> <p>Description: Demonstrate and validate advanced water reuse technology for fixed installations and assess ESOH impacts. At the completion of this program, the following will be accomplished: 1) demonstration of energy efficient advanced water reuse technology at installations, 2) ESOH analysis of three water reuse technologies for installations including shower water recycling, distributed water reclamation, and centralized reclamation; 3) reports on best practices for permitting, design, and safe operation of advanced reuse technologies; and 4) marketing materials comparing quality of advanced reuse water to tap and bottled water to support technology adoption campaigns at installations and contingency bases.</p>		0.572	-	-
<p>Title: Environmental quality technology demonstration and validation: Insensitive Munitions (IM) Wastewater Treatment</p> <p>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.</p>		1.575	1.685	1.635

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>FY 2019 Plans: Transition IM wastewater treatment technologies from a prototype pilot scale system to an initial field-scale pilot system for demonstration and validation of cost effective treatment of IM wastewater.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to economic adjustment.</p>				
<p>Title: Environmental quality technology demonstration and validation: Fate and Risk Evaluation System for Contaminants (FRESCO?)</p> <p>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.</p> <p>FY 2019 Plans: Will demonstrate software for environmental fate and transport data with user community for evaluation.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding change due to economic adjustment.</p>		-	1.254	1.500
<p>Title: Environmental quality technology demonstration and validation: Environmental Toolkit for Expeditionary Operations</p>		-	1.275	0.825

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans: Will demonstrate software and sensors package for environmental baseline evaluation capabilities with engineer soldiers.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to economic adjustment.</p>				
<p>Title: Explosive Ordnance Disposal (ERDC)</p> <p>Description: Evaluate innovative technology that would reduce the environmental impact associated with the remediation of munitions by eliminating the explosive hazard while leaving munitions' bodies in place. Effort partners ERDC with industry to demonstrate and validate the use of cut and capture technologies, supporting the recommended leave-in-place scenario.</p>		4.975	-	-
<p>Title: FY2019 SBIR/STTR Transfer</p> <p>Description: FY2019 SBIR/STTR Transfer</p> <p>FY 2019 Plans: FY2019 SBIR/STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 SBIR/STTR Transfer</p>		-	0.362	-
Accomplishments/Planned Programs Subtotals		11.411	9.867	10.011

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 06l: <i>Environmental Quality Technology Support</i>	0.682	0.921	0.562	-	0.562	0.605	0.614	0.651	0.426	0.000	4.461

Remarks

D. Acquisition Strategy

The project ultimately transitions successfully demonstrated environmental quality technologies to Army acquisition, industrial base and installation end users. As part of the Army's Environmental Quality Technology Program, all technology efforts address a valid Army Environmental Requirements and Technology Assessments (AERTA) requirement. The Army's Environmental Technology Integrated Product Team conducts a thorough assessment and makes funding recommendations to senior Army environmental leadership. Efforts approved by senior Army 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FY2019 SBIR/STTR Transfer	TBD	TBD : TBD	-	-		0.362	Oct 2018	-		-		-	0.000	0.362	-
Subtotal			-	-		0.362		-		-		-	0.000	0.362	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Conduct Demonstrations	MIPR	Varies : Varies	15.881	11.411		9.505	Oct 2018	10.011	Oct 2019	-		10.011	Continuing	Continuing	Continuing
Subtotal			15.881	11.411		9.505		10.011		-		10.011	Continuing	Continuing	N/A

Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals	15.881	11.411	9.867	10.011	-	10.011	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Toxic Metals Reduction Demonstration/Validation	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]			
Airborne Lead Reduction Demonstration/Validation																																
ESOH Impacts of Short-Term Noise Assessment Procedures De																																
Advanced Water Reuse Technology for Fixed Installations																																
Insensitive Munitions (IM) Wastewater Treatment																																
Fate and Risk Evaluation System for Contaminants																																
Environmental Toolkit for Expeditionary Operations																																
Low Global Warming Potential Dem/Val																																
Securing the Availability of Green, Enhanced Coatings Dem/Val																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603779A / <i>Environmental Quality Technology - Dem/Val</i>	Project (Number/Name) E21 / <i>Environmental Quality Technology Dem/Val</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Toxic Metals Reduction Demonstration/Validation	1	2015	4	2023
Airborne Lead Reduction Demonstration/Validation	1	2015	4	2024
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	2023
Securing the Availability of Green, Enhanced Coatings Dem/Val	1	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603790A / NATO Research and Development
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	2.485	3.682	5.406	-	5.406	5.516	4.556	5.706	5.763	0.000	33.114
691: <i>NATO Rsch & Devel</i>	-	2.485	3.682	5.406	-	5.406	5.516	4.556	5.706	5.763	0.000	33.114

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)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	2.588	3.687	4.448	-	4.448
Current President's Budget	2.485	3.682	5.406	-	5.406
Total Adjustments	-0.103	-0.005	0.958	-	0.958
• Congressional General Reductions	-0.002	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.101	-			
• Adjustments to Budget Years	-	-	0.958	-	0.958

Change Summary Explanation

FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / NATO Research and Development	Project (Number/Name) 691 / NATO Rsch & Devel
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
691: NATO Rsch & Devel	-	2.485	3.682	5.406	-	5.406	5.516	4.556	5.706	5.763	0.000	33.114
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 2018	FY 2019	FY 2020
Title: Armaments Cooperation Enterprise Support	1.876	2.687	4.098
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 2019 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 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.</p>				
<p>Title: Communications Interoperability, and Electronics Technologies</p> <p>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.</p> <p>FY 2019 Plans: FY 2019 funds include efforts from areas formerly titled Multi-National Network Enabled Capabilities, Low Level Air Defense Interoperability, JTRS, Combat Identification, and Multilateral Interoperability Program.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.</p>		0.141	0.203	0.302
<p>Title: Senior National Representatives (Army) (SNR-(A))</p> <p>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</p>		0.015	0.021	0.031

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
of participating NATO nations with a view to assisting future operational and materiel interoperability. Army support of NAAG studies, analysis and technology demonstrations.				
FY 2019 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 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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.				
Title: Weapons and Munitions Technologies		0.113	0.163	0.243
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 2019 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 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 2019 to FY 2020 Increase/Decrease Statement:				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.				
<p>Title: Ground Systems Technologies</p> <p>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.</p> <p>FY 2019 Plans: FY 2019 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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.</p>		0.113	0.163	0.243
<p>Title: Aviation Systems Technologies</p> <p>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.</p> <p>FY 2019 Plans: FY 2019 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).</p> <p>FY 2020 Plans:</p>		0.227	0.327	0.489

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase of \$1.052 million to support the Army's modernization priorities in support of the National Defense Strategy.				
Title: FY 2019 SBIR / STTR Transfer		-	0.118	-
Description: FY 2019 SBIR / STTR Transfer				
FY 2019 Plans: FY 2019 SBIR / STTR Transfer				
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer				
Accomplishments/Planned Programs Subtotals		2.485	3.682	5.406
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 curenly 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				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / <i>NATO Research and Development</i>	Project (Number/Name) 691 / <i>NATO Rsch & Devel</i>
<p>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.</p> <p>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.</p> <p>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 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.</p> <p>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.</p> <p>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.</p> <p><u>E. Performance Metrics</u> N/A</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / NATO Research and Development	Project (Number/Name) 691 / NATO Rsch & Devel
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603790A / NATO Research and Development	Project (Number/Name) 691 / NATO Rsch & Devel
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Armaments Cooperation Enterprise Support	C/FFP	LSS/GDIT : Fairfax, VA	4.762	1.877		1.864		2.870		-		2.870	0.000	11.373	-
Missiles and Rocket Technologies	MIPR	APG, Redstone Arsenal : MD, AL	0.100	-		0.600		0.895		-		0.895	0.000	1.595	-
Communications, Interoperability, and Electronics Technologies	MIPR	Joint Tactical Radio (JTRS), JTNC, COALWNW, SPAWAR, CERDEC, ARDEC W1DF : San Diego, CA, Red Stone Arsenal	0.818	0.141		0.300		0.448		-		0.448	0.000	1.707	-
Aviation Systems Technologies	MIPR	RDECOM/ AMRDEC : Red Stone Arsenal	0.585	0.225		0.300		0.448		-		0.448	0.000	1.558	-
Ground Systems Technology	MIPR	TARDEC : Various	0.365	0.113		-		-		-		-	0.000	0.478	-
Weapons and Munitions	Various	CECOM, ARDEC, AMMO, PEO C3T : Aberdeen Proving Ground, Various	0.926	0.113		0.500		0.745		-		0.745	0.000	2.284	-
Soldier Technologies	TBD	Various : Various	0.346	-		-		-		-		-	0.000	0.346	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603790A / NATO Research and Development				691 / NATO Rsch & Devel							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
SNR(A)	C/TBD	ARL, HQDA, JCGISR: Army : Various	2.302	0.016		-		-		-		-	Continuing	Continuing	Continuing
Chemical & Biological Defense Technologies	MIPR	ECBC : Edgewood, Aberdeen, MD	0.270	-		-		-		-		-	0.000	0.270	-
Subtotal			10.474	2.485		3.564		5.406		-		5.406	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	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
Project Cost Totals			21.989	2.485		3.682		5.406		-		5.406	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army							Date: March 2019				
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 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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																												

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
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

Events	Start		End	
	Quarter	Year	Quarter	Year
N/A	1	2017	4	2017

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603801A / <i>Aviation - Adv Dev</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	9.653	86.180	459.290	-	459.290	536.067	656.804	661.194	801.200	Continuing	Continuing
B47: <i>Future Vertical Lift</i>	-	9.653	86.180	31.990	-	31.990	22.067	45.104	230.294	652.900	Continuing	Continuing
F12: <i>Future Attack Reconnaissance Aircraft</i>	-	0.000	0.000	427.300	-	427.300	514.000	611.700	430.900	148.300	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. FVL was established by the Secretary of Defense to focus all Department of Defense (DoD) vertical lift capabilities and technology development as well as retain long-term engineering capabilities. The Deputy Secretary of Defense issued the FVL Strategic Plan 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 2017, FVL was identified as one of the Army's eight Cross Functional Team Pilots, derived from the six Chief of Staff of the Army modernization priorities. The development and fielding of FVL will significantly improve vertical lift capabilities providing critical aviation support to the Joint warfighting community. Increases in maneuverability, range, speed, payload, survivability, reliability, and reduced logistical footprint can only be achieved through the FVL approach of developing new aircraft designs. FVL will integrate advancements in technologies and design configurations balanced with appropriate trades to ensure affordability.

B. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	14.055	10.793	21.690	-	21.690
Current President's Budget	9.653	86.180	459.290	-	459.290
Total Adjustments	-4.402	75.387	437.600	-	437.600
• Congressional General Reductions	-0.008	-0.013			
• Congressional Directed Reductions	-4.000	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	75.400			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.394	-			
• Adjustments to Budget Years	-	-	437.600	-	437.600

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

Project: B47: *Future Vertical Lift*

Congressional Add: *Future Attack Reconnaissance Aircraft*

	FY 2018	FY 2019
	-	75.400

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603801A / <i>Aviation - Adv Dev</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Congressional Add Subtotals for Project: B47	-	75.400
Congressional Add Totals for all Projects	-	75.400

Change Summary Explanation

The FY 2018 funding request was reduced by \$4M due to a delay in the FVL Project B47's Future Long Range Assault Aircraft (FLRAA) Analysis of Alternatives.

The FY 2019 funding request was increased for the Army's future vertical lift program to initiate the Capability Set One Future Attack Reconnaissance Aircraft (FARA) competitive prototyping effort. In FY 2020 and beyond, FARA funds are requested under Project F12 Future Attack Reconnaissance Aircraft.

The FY 2020 funding request increase (\$10.300M) in PE 0603801A B47 for Future Long Range Attack Aircraft is the funding required to support the Army's opportunity to accelerate the FLRAA program schedule.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
B47: Future Vertical Lift	-	9.653	86.180	31.990	-	31.990	22.067	45.104	230.294	652.900	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Future Vertical Lift Project's funding provides for the development of a Future Long Range Assault Aircraft (FLRAA) Capability Set Three (CS3) aircraft system within the FVL family of systems. FVL FLRAA (CS3) aircraft will conduct Air Assault, Amphibious Assault, Urban Assault/Security, Attack, Maritime Interdiction, Medical Evacuation (MEDEVAC), Humanitarian Assistance/Disaster Relief (HA/DR), Tactical Resupply, Direct Action (DA), Non-Combatant Evacuation Operation (NEO) and Combat Search and Rescue (CSAR) operations in support of Army, including Army Special Operations Command, Marine Corps and Joint forces. The FVL FLRAA (CS3) platform will significantly increase speed, range, mobility, and payload over current US Army H-60 and US Marine Corps H-1 aircraft and provide Combatant Commanders with tactical capabilities at greatly increased operational and strategic distances. The FVL Capability Set 3 Materiel Development Decision was approved October 2016. FY 2018 funding continued to support FVL AoA modeling, simulation and analysis to include risk, cost and affordability, sustainment and trades and initiation of the Test Evaluation and Master Plan (TEMP), Draft Capability Development Document (CDD), Acquisition Strategy, Life Cycle Cost Estimate, and Life Cycle Sustainment Plan (LCSP). FY 2019 funding will complete the AoA efforts, Acquisition Planning and Strategy Development and LCSP, conduct Initial Readiness Assessments, prepare Systems Engineering decomposition and translation of Draft CDD into Weapon System Specification, and initiate the balance of Milestone A documentation and Technology Maturation and Risk Reduction (TMRR) Contract Requirements Package (CRP). FY 2020 funding will support the completion and staffing of key Milestone A documentation to include the Acquisition Strategy, the Weapon System Specification, the Systems Engineering Plan, and the LCSP and will support the continued development of the TEMP and the CRP. The Army is continuing to seek opportunities to accelerate the FLRAA program schedule.

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

	FY 2018	FY 2019	FY 2020
Title: Future Vertical Lift (FVL) Analysis of Alternatives	2.039	1.190	-
Description: FVL Analysis of Alternatives modeling, simulation, and analysis performed by U.S. Army TRADOC Analysis Center, U.S. Army Materiel Systems Analysis Activity and other supporting agencies.			
FY 2019 Plans: Effort will be completed in FY 2019.			
FY 2019 to FY 2020 Increase/Decrease Statement: The AoA will conclude in FY 2019.			
Title: Engineering Services / Research Studies	4.431	6.296	23.032
Description: Engineering research, planning, modeling, analyses and reviews supporting the FVL acquisition program.			
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
<p>Conduct Initial Readiness Assessment, prepare Systems Engineering Decomposition and Translation of Draft Capability Development Documentation (CDD) into Weapon System Specification and initiate Milestone A documentation development.</p> <p>FY 2020 Plans: Will complete and staff key Milestone A documentation to include the Weapon System Specification and Systems Engineering Plan and continue developing the TEMP and CRP.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Engineering staff ramp up to support activities leading to Milestone A and TMRR Contract Award.</p>				
<p>Title: Program Management</p> <p>Description: Oversight and management of the FVL acquisition program.</p> <p>FY 2019 Plans: Complete Acquisition Planning and Strategy Development for FVL Capability Set 3 aircraft. Begin development of Milestone A documentation and TMRR Contracts Requirements Package.</p> <p>FY 2020 Plans: Complete and staff key Milestone A documentation to include the Acquisition Strategy and continue developing the CRP.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program staff ramp up to support activities leading to Milestone A and TMRR Contract Award.</p>		2.448	1.695	5.280
<p>Title: Supportability Analysis and Acquisition Support</p> <p>Description: Acquisition and supportability planning and development of documentation on the FVL program.</p> <p>FY 2019 Plans: Complete the development of the Life Cycle Sustainment Plan and participate in the development of the Contracts Requirements Package to support the TMRR Request for Proposal (RFP) release.</p> <p>FY 2020 Plans: Will complete the staffing of the LCSP and continue developing the CRP.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Staff ramp up to support activities leading to Milestone A and TMRR Contract Award.</p>		0.735	1.204	3.678
<p>Title: FY 19 SBIR/STTR Transfer</p> <p>Description: FY 2019 SBIR/STTR Transfer</p>		-	0.395	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) B47 / Future Vertical Lift
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<i>FY 2019 Plans:</i> FY 2019 SBIR/STTR Transfer			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR/STTR Transfer			
Accomplishments/Planned Programs Subtotals	9.653	10.780	31.990

	FY 2018	FY 2019
<i>Congressional Add:</i> Future Attack Reconnaissance Aircraft	-	75.400
<i>FY 2019 Plans:</i> Future Attack Reconnaissance Aircraft		
Congressional Adds Subtotals	-	75.400

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

<u>Line Item</u>	FY 2018	FY 2019	FY 2020 <u>Base</u>	FY 2020 <u>OCO</u>	FY 2020 <u>Total</u>	FY 2021	FY 2022	FY 2023	FY 2024	<u>Cost To Complete</u>	<u>Total Cost</u>
• 313: Adv Rotarywing Veh Tech	142.093	113.678	0.000	-	0.000	-	-	-	-	0.000	255.771

Remarks
PE 0603003A/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. This will enable Army aviation modernization and reduce risk for FVL FLRAA.

D. Acquisition Strategy

An Analysis of Alternatives (AoA) was initiated in 3rd Quarter FY 2017 to assess the technical feasibility, operational feasibility, technical risk, and affordability of potential materiel solutions. The AoA will be informed by previous studies, ongoing Advanced Technology Development S&T projects, and input from government, industry and academia. The results of the AoA and Initial Readiness Assessments will be available to support a projected Milestone A decision in 4th Quarter FY 2021 and a Technology Maturation and Risk Reduction (TMRR) Request for Proposal (RFP) Release in 1st Quarter FY 2022. After a successful Source Selection Evaluation Board, the Army will award competitive TMRR contracts to complete preliminary design and risk reduction testing.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) B47 / Future Vertical Lift
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	FVL Program Office : Redstone Arsenal, AL	0.320	2.448	Nov 2017	1.695	Dec 2018	5.280	Dec 2019	-		5.280	Continuing	Continuing	Continuing
Subtotal			0.320	2.448		1.695		5.280		-		5.280	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Analysis of Alternatives (AoA)	TBD	TRADOC Analysis Center : Fort Leavenworth, KS	2.430	2.039	Nov 2017	1.190	Nov 2018	-		-		-	0.000	5.659	-
Subtotal			2.430	2.039		1.190		-		-		-	0.000	5.659	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Services / Research Studies - Organic	MIPR	FVL Program Office : Redstone Arsenal AL	0.549	1.432	Nov 2017	5.132	Nov 2018	13.405	Nov 2019	-		13.405	Continuing	Continuing	Continuing
Engineering Services / Research Studies - Other	C/FFP	GSA : Atlanta, GA	3.978	2.999	Aug 2018	1.164	Aug 2019	9.627	Aug 2019	-		9.627	Continuing	Continuing	Continuing
Acquisition and Supportability Analysis	MIPR	Army Logistics Command / Army Contracting Command : Redstone Arsenal, AL	0.425	0.735	Nov 2017	1.204	Dec 2018	3.678	Nov 2019	-		3.678	Continuing	Continuing	Continuing
Future Attack Reconnaissance Aircraft Execution	C/Various	AMRDEC : RSA	-	-		75.400	Jun 2019	-		-		-	0.000	75.400	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.395		-		-		-	0.000	0.395	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) B47 / Future Vertical Lift
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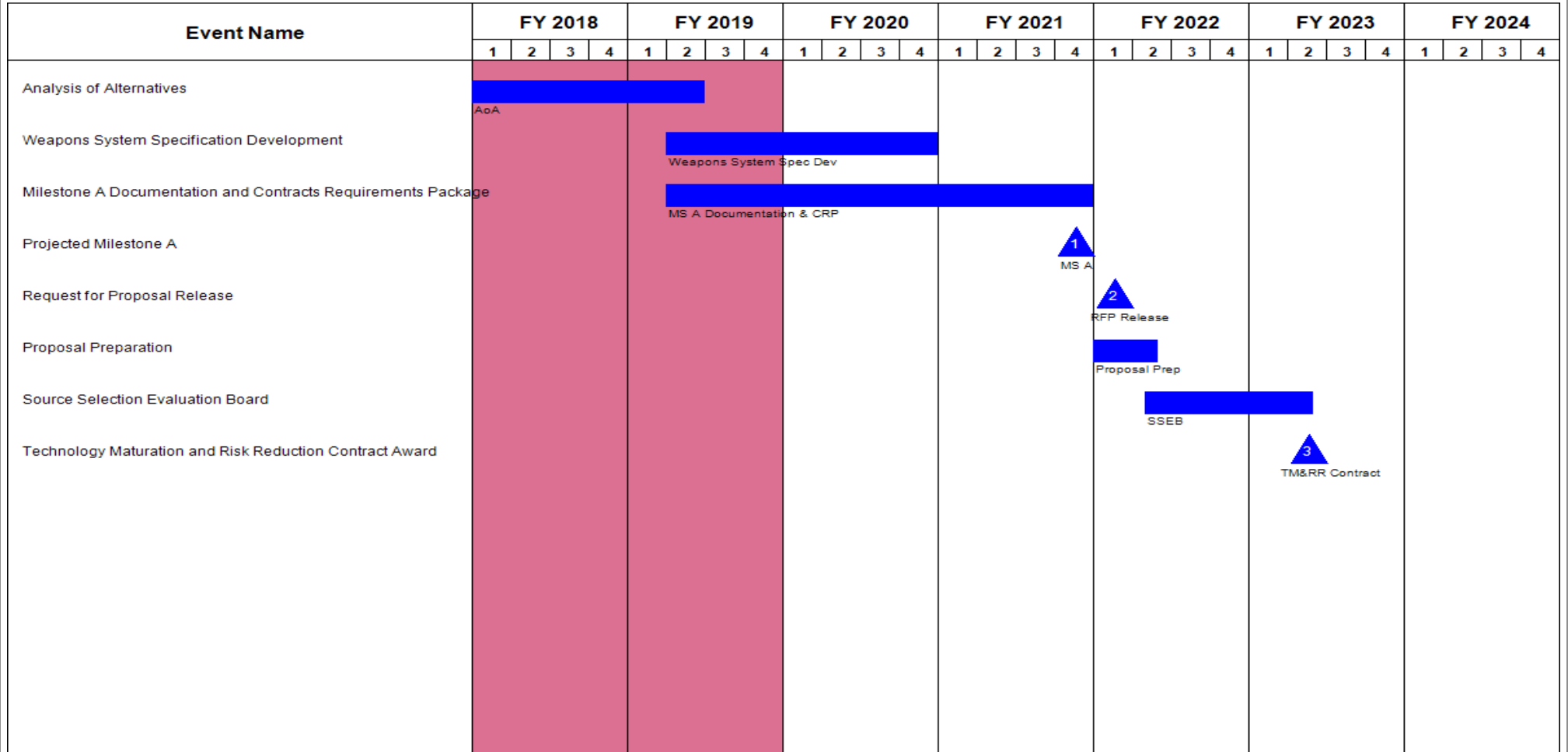
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			4.952	5.166		83.295		26.710		-		26.710	Continuing	Continuing	N/A
			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract				
Project Cost Totals			7.702	9.653	86.180	31.990	-	31.990	Continuing	Continuing	N/A				

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) B47 / Future Vertical Lift
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) B47 / Future Vertical Lift
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Analysis of Alternatives	3	2017	2	2019
Weapons System Specification Development	2	2019	4	2020
Milestone A Documentation and Contracts Requirements Package	2	2019	4	2021
Projected Milestone A	4	2021	4	2021
Request for Proposal Release	1	2022	1	2022
Proposal Preparation	1	2022	2	2022
Source Selection Evaluation Board	2	2022	2	2023
Technology Maturation and Risk Reduction Contract Award	2	2023	2	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) F12 / Future Attack Reconnaissance Aircraft
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
F12: Future Attack Reconnaissance Aircraft	-	0.000	0.000	427.300	-	427.300	514.000	611.700	430.900	148.300	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project F12 transitioned from BA3 PE 0603003A (Aviation Advanced Technology).

A. Mission Description and Budget Item Justification

The Future Attack Reconnaissance Aircraft Project's funding provides for the development of a Capability Set 1 aircraft system within the FVL family of systems. FVL Capability Set 1 aircraft will conduct attack/reconnaissance missions in support of the Army. The FVL Capability Set 1 platform will fill the gap in capability for light weight attack/reconnaissance while significantly increasing speed, range, survivability, and lethality over the previously used OH-58 and provide 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).

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

	FY 2018	FY 2019	FY 2020
Title: Future Attack Reconnaissance Aircraft	-	-	427.300
Description: Design, build, and test competitive prototypes in preparation for rapid acquisition and fielding.			
FY 2020 Plans: At the completion of the initial design phase, two industry solutions will be chosen to continue to final design, build, and test.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding in 2019 initiates the effort and in 2020, the two selectees begin to finalize and build the designs.			
Accomplishments/Planned Programs Subtotals	-	-	427.300

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

N/A

Remarks

D. Acquisition Strategy

The Future Attack Reconnaissance Aircraft (FARA) received a Congressional plus up (\$75.4M) in FY 2019 within the Project B47 FVL line. A streamlined acquisition approach is planned by executing a competitive prototyping effort thru FY 2023 leading to entry to a formal program of record, potentially at MS B, in 2024 for an EMD phase and production. Four to six vendor solutions will be evaluated starting in FY 2019 thru FY 2020 resulting in a downselect to two vendor solutions for final design, build, and test, which will provide the required data and information to downselect to one solution for the EMD phase.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) F12 / Future Attack Reconnaissance Aircraft

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) F12 / Future Attack Reconnaissance Aircraft
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Competitive Prototype Design					Competitive Prototype Design																											
Competitive Prototype Build									Competitive Prototype Build																							
Competitive Prototype Test																					Competitive Prototype Test											
Material Development Decision																					MDD											
Milestone B Document Development																					MBDD											
Contract Requirement Package Development																					Contract Requirement Package Development											
Request for Proposal Release																									RFP Release							
Proposal Submission/Evaluation																									Proposal Submission/Eva							
Milestone B																									Milestone B							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603801A / Aviation - Adv Dev	Project (Number/Name) F12 / Future Attack Reconnaissance Aircraft
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Competitive Prototype Design	3	2019	2	2020
Competitive Prototype Build	3	2020	4	2022
Competitive Prototype Test	1	2023	4	2023
Material Development Decision	2	2022	2	2022
Milestone B Document Development	2	2022	4	2024
Contract Requirement Package Development	2	2022	4	2023
Request for Proposal Release	1	2024	1	2024
Proposal Submission/Evaluation	1	2024	4	2024
Milestone B	4	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	29.619	17.230	6.254	1.085	7.339	6.124	6.319	5.809	5.939	0.000	78.379
<i>526: Marine Orien Log Eq Ad</i>	-	3.305	3.891	2.916	1.085	4.001	2.923	2.914	2.608	2.611	0.000	22.253
<i>EW8: Armored Engineer Vehicles</i>	-	11.712	1.482	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.194
<i>G11: Adv Elec Energy Con Ad</i>	-	4.982	6.331	3.338	-	3.338	3.201	3.405	3.201	3.328	0.000	27.786
<i>K39: Field Sustainment Support Ad</i>	-	2.332	2.308	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.640
<i>K41: Water And Petroleum Distribution - Ad</i>	-	3.954	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.954
<i>VR8: Combat Service Support Systems - Ad</i>	-	3.334	3.218	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.552

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, 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, regulatory compliance and reliability of existing systems.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	35.333	14.248	14.387	-	14.387
Current President's Budget	29.619	17.230	6.254	1.085	7.339
Total Adjustments	-5.714	2.982	-8.133	1.085	-7.048
• Congressional General Reductions	-0.025	-0.018			
• Congressional Directed Reductions	-4.500	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	3.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.189	-			
• Adjustments to Budget Years	-	-	-8.133	1.085	-7.048

Change Summary Explanation

FY19 funding request was increased by \$3.00 million to support tactical electric program research for remote and forward operating bases
 FY 2020 funding requests was reduced by \$7.048 million to support the Army's modernization priorities in support of the National Defense Strategy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) 526 / <i>Marine Orien Log Eq Ad</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
526: <i>Marine Orien Log Eq Ad</i>	-	3.305	3.891	2.916	1.085	4.001	2.923	2.914	2.608	2.611	0.000	22.253
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports efforts and studies for advanced component development, including prototypes of equipment and sub-systems which provide critical capabilities for Unified Land Operations (ULO), by extending the Commander's available maneuver space into and throughout the littorals, inland waterways and near coastal regions. Army watercraft equipment enables the conduct of riverine, Logistics-over-the-Shore (LOTS) and Joint Logistics-over-the-Shore (JLOTS), inter and intra-theater transport, movement and maneuver, mission command and sustainment, as identified in DODD 5100.01 (Functions of the Department of Defense and its major components). Army Watercraft exploit the inland waterways and littoral regions as waterborne maneuver and supply routes, conducting operations through littoral entry points (developed, undeveloped, and austere access points) and in non-permissive, and/or denied access scenarios. The Army uses a spectrum of Army Watercraft systems, from heavy sustainment ocean going landing craft capable of intra-theater and ship to shore transport and undeveloped beach or harbor access, to oceangoing and harbor utility tug boats and barge derricks for transport and denied port/salvage operations, and modular causeway systems for (LOTS/JLOTS). The funding supports initiatives to enhance the seaworthiness, safety, survivability, supportability, energy efficiency, environmental, regulatory compliance and reliability of existing systems. Funded efforts will address critical gaps in these areas for the current fleet, while at the same time researching, developing and testing emergent technologies. To support future acquisitions and future fleet planning, funding efforts which 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.

FY20 funding supports modernization of the Legacy fleet wide systems by investigating technology insertions including, but not limited to: condition based maintenance, vessel electronics, Victory 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.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: At Sea Transfer Technology	2.158	2.150	1.026	-	1.026
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 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Orient Log Eq Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Complete SLEP design prototype; perform testing of MWT/CF SLEP prototype; and complete MWT/CF Production Level TDP.</p> <p>FY 2020 Base Plans: Perform testing of MWT/CF SLEP prototype and to complete Technical Data Package for a reference for the Maritime workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: MWT initial design is planned for completion in FY19. FY20 will focus on the testing phase, which is anticipated to require a lower dollar value.</p>					
<p>Title: Environmental Compliance Projects</p> <p>Description: Environmental projects enable compliance with requirements as defined in law under 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.</p> <p>FY 2019 Plans: Continue identification of Environmental Compliance Technologies IAW evolving statutory and regulatory requirements; continue MSD shipboard test and evaluation; continue OWS requirement and capability analysis; and continue Clean Ballast Water requirement and capability analysis.</p> <p>FY 2020 Base 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The following UNDS efforts meet compliance standards and will conclude in FY19, thereby reducing funding requirements: - MSD shipboard test and evaluation. - OWS requirement and capability analysis. - Clean Ballast Water requirement and capability analysis.</p>	0.459	0.506	0.060	-	0.060
<p>Title: Force Protection Capability</p>	0.619	0.640	0.500	-	0.500

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Oriented Log Eq Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>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 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).</p> <p>FY 2019 Plans: Install and test CROWS aboard LSV-7 class.</p> <p>FY 2020 Base Plans: Will design, install, and test CROWS aboard LCU and LSV 7 class vessels.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort funding change due to economic adjustment - no significant change in work efforts.</p>					
<p>Title: Army Watercraft Program Support</p> <p>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.</p> <p>FY 2019 Plans: Provide engineering matrix Support and fund Navy for UNDS analysis and committee representation.</p> <p>FY 2020 Base Plans: Will provide MWT Engineering test support as well as engineering and Naval support for the Fleet.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort funding change due to economic adjustment - no significant change in work efforts.</p>	0.069	0.370	0.300	-	0.300
<p>Title: Trade Studies and Business Analyses</p> <p>Description: Conduct Affordability and Feasibility Studies to include support of Analysis of Alternatives for future vessel platforms.</p> <p>FY 2019 Plans:</p>	-	0.100	1.030	-	1.030

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>		Project (Number/Name) 526 / <i>Marine Oriented Log Eq Ad</i>	
B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Support initiation of Feasibility Study for future vessel platforms.					
FY 2020 Base 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, Intelligence, Surveillance and Reconnaissance (C4ISR) upgrades and joint operation capabilities for legacy vessels.					
FY 2019 to FY 2020 Increase/Decrease Statement: Effort increases by adding human factor engineer analysis and initiation of electrical power studies to support C4ISR upgrades and joint operation capabilities for Legacy Vessels.					
Title: SEAFLIR Integration Kits					
Description: Integration of SEAFLIR 280 HD maritime infrared imaging system for maritime use on LSV and LCU vessels. The SEAFLIR 280-HD maritime imaging system greatly reduces the ability for the Army Watercraft to identify and track smugglers, terrorists, or any other threat day and night that they encounter operating in support of current named operations and contingency operational requirements as part of USARCENT COMPLANS.					
FY 2020 Base Plans: N/A Base RDTE funds.					
FY 2020 OCO Plans: Initiate an effort to analyze, design, and develop a prototype for installing the SEAFLIR on the LSV 1 Class and LCU.					
FY 2019 to FY 2020 Increase/Decrease Statement: No funding received in FY19 for SEAFLIR					
Title: FY2019 SBIR/STTR Transfer					
	-	0.125	-	-	-
FY 2019 Plans: 2019 SBIR/STTR Transfer					
FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 SBIR/STTR Transfer					
Accomplishments/Planned Programs Subtotals					
	3.305	3.891	2.916	1.085	4.001

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Oriented Log Eq Ad</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>			<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• MA4501: <i>MODIFICATION KITS</i>	20.980	25.201	34.587	4.234	38.821	16.407	16.840	16.354	7.393	0.000	141.996
• MA4502: <i>INSTALLATION OF MODIFICATIONS</i>	23.233	12.278	5.438	-	5.438	5.434	2.792	2.954	2.955	0.000	55.084
• M11101: <i>Army Watercraft Esp</i>	20.110	8.508	35.194	-	35.194	40.953	36.646	33.957	30.541	0.000	205.909
• ML5355: <i>Items Less Than \$5.0M (Float/Rail)</i>	2.877	8.385	6.920	-	6.920	1.846	-	-	-	0.000	20.028

Remarks

FY 2018 Accomplishments:

- Continue the development of the MWT/CF SLEP design solution; initiated prototype production.
- Continue EOF development on LSV CROWS.
- Completed identification of Environmental Compliance Technologies IAW evolving statutory and regulatory requirements.
- Material Sanitation Device (MSD) shipboard test and evaluation.
- Oil Water Separator (OWS) requirement and capability analysis.
- Clean Ballast Water requirement and capability analysis.

D. Acquisition Strategy

Leverage government and public research centers (TARDEC and Naval Surface Warfare Center (NSWC) Philadelphia) 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / Logistics and Engineer Equipment - Adv Dev	Project (Number/Name) 526 / Marine Oriented Log Eq Ad
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Force Protection, Escalation of Force (EoF) Development (i.e. CROWS)	MIPR	TARDEC : Warren, MI	2.649	0.619	Jul 2018	0.640	Feb 2019	0.500	Feb 2020	-		0.500	Continuing	Continuing	-
At Sea Transfer Systems (Modular Warping Tug / Causeway Ferry)	SS/CPFF	TARDEC DTIC - I, Battelle : Fort Belvoir, VA	2.216	2.158	Aug 2018	2.150	Feb 2019	1.026	Nov 2019	-		1.026	Continuing	Continuing	-
Environmental Compliance Uniform National Discharge Standards (UNDS)	MIPR	Carderock : Maryland and Pennsylvania	2.822	0.459	Feb 2018	0.506	Jan 2019	0.060	Dec 2019	-		0.060	Continuing	Continuing	-
Trade Study Analyses	TBD	TBD : TBD	-	-		0.100	Sep 2019	1.030	Feb 2020	-		1.030	Continuing	Continuing	-
SEA FLIR Integration	MIPR	TARDEC : Warren, MI	-	-		-		0.000		1.085	Oct 2019	1.085	0.000	1.085	-
2019 SIBR/STTR Transfer	TBD	TBD : TBD	-	-		0.125		-		-		-	0.000	0.125	-
Subtotal			7.687	3.236		3.521		2.616		1.085		3.701	Continuing	Continuing	N/A

Remarks
 Significant Changes from FY19-20:
 -MWT initial design is planned for completion in FY19. FY20 will focus on the testing phase, which is anticipated to require a lower dollar value.
 -The following UNDS efforts meet compliance standards and will conclude in FY19:
 - MSD shipboard test and evaluation.
 - OWS requirement and capability analysis.
 - Clean Ballast Water requirement and capability analysis.
 - Trade Studies and Business Analyses from FY19-20 increases by adding human factor engineer analysis and initiation of electrical power studies to support C4ISR upgrades and joint operation capabilities for Legacy Vessels.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Watercraft Program Support	MIPR	Detroit Arsenal PMs, TARDEC, NAVSEA Carderock :	1.358	0.069	Nov 2017	0.370	Dec 2018	0.300	Dec 2019	-		0.300	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army											Date: March 2019		
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) 526 / <i>Marine Orien Log Eq Ad</i>					

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		Maryland, Warren, MI													
Subtotal			1.358	0.069		0.370		0.300		-		0.300	Continuing	Continuing	N/A

Remarks
Matrix Employees are funded through a reimbursable MIPR and disbursed monthly.

Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	9.045	3.305		3.891		2.916		1.085	4.001	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Orien Log Eq Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Army Watercraft Program Support																												
Force Protection: Common Remotely Operated Weapon Station																												
Force Protection: CROWS on LSV-1 Class																												
Force Protection: CROWS on LSV-7 Class																												
Force Protection: CROWS on LCU 2000 Class																												
At Sea Transfer Technology																												
Modular Warping Tug (MWT) / Causeway Ferry (CF)																												
MWT / CF - SLEP Development Contract																												
MWT / CF - SLEP Prototype and Proof Concept																												
MWT / CF - SLEP Testing																												
Environmental Compliance																												
Uniformed National Discharge Standards (UNDS)																												
UNDS Batch 2																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Orien Log Eq Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				
	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	
UNDS Batch 3																					3								
Trade Studies and Business Analyses																					3								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) 526 / <i>Marine Oriented Log Eq Ad</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Army Watercraft Program Support	1	2018	4	2024
Force Protection: Common Remotely Operated Weapon Station (CROWS)	1	2018	4	2024
Force Protection: CROWS on LSV-1 Class	1	2018	3	2020
Force Protection: CROWS on LSV-7 Class	2	2019	4	2021
Force Protection: CROWS on LCU 2000 Class	1	2018	4	2024
At Sea Transfer Technology	1	2018	4	2024
Modular Warping Tug (MWT) / Causeway Ferry (CF)	1	2018	4	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	2021
Environmental Compliance	1	2018	4	2024
Uniformed National Discharge Standards (UNDS)	1	2018	4	2022
UNDS Batch 2	4	2020	4	2020
UNDS Batch 3	4	2022	4	2022
Trade Studies and Business Analyses	4	2019	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EW8: <i>Armored Engineer Vehicles</i>	-	11.712	1.482	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.194
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2020 funding cancelled for Armored Mobile Earthmover (AME) development

A. Mission Description and Budget Item Justification

This Project supports live fire test and evaluation, initial operational test and evaluation and production qualification testing of the Joint Assault Bridge (JAB).

FY 2020 funding cancelled for Armored Mobile Earthmover (AME) development.

Funding supports modernization of Army Bridging 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Joint Assault Bridge (JAB)	11.712	-	-	-	-
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 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)	-	1.435	-	-	-
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.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: Funding supports Analysis of Alternatives (AOA) study to be conducted by the Army Capabilities Integration Center.					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding cancelled for Mobile Armored Combat Earthmover (MACE) development.					
Title: FY 2019 SBIR / STTR Transfer	-	0.047	-	-	-
FY 2019 Plans: SBIR / STTR					
FY 2019 to FY 2020 Increase/Decrease Statement: Adjusted for FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	11.712	1.482	-	-	-

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• GZ3001: <i>Joint Assault Bridge</i>	128.350	139.146	205.517	-	205.517	198.392	264.044	278.931	254.406	Continuing	Continuing

Remarks

D. Acquisition Strategy
Funding will support RDT&E efforts to support testing and follow-on production for Assault Bridging.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Support	MIPR	Various : Various	-	0.779	Oct 2017	0.150	Oct 2018	-		-		-	0.000	0.929	-
Subtotal			-	0.779		0.150		-		-		-	0.000	0.929	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	Oct 2017	-		-		-		-	0.000	2.084	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.047		-		-		-	0.000	0.047	-
Subtotal			-	2.084		1.332		-		-		-	0.000	3.416	N/A

Remarks
\$2.37M increase to FY18 product developmental costs associated with post Live Fire testing Force Protection Enhancements / Live Fire Remediation.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JAB Initial Operational Test & Evaluation (IOTE)	MIPR	Operational Test Command : Ft. Hood, TX	-	3.143	Mar 2018	-		-		-		-	0.000	3.143	-
JAB Production Qualification Testing (PQT)	MIPR	Aberdeen Test Center : Aberdeen Proving Grounds, MD	-	3.936	Nov 2017	-		-		-		-	0.000	3.936	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JAB Prototype Live Fire Validation	MIPR	Aberdeen Test Center : Aberdeen Proving Grounds, MD	-	1.500	Feb 2018	-		-		-		-	0.000	1.500	-
JAB Logistics Demonstration	TBD	Army Operational Test Command (AOTC) : Ft. Hood, TX	-	0.270	Aug 2018	-		-		-		-	0.000	0.270	-
Subtotal			-	8.849		-		-		-		-	0.000	8.849	N/A

Remarks
FY18 Test and Evaluations costs have also been adjusted to reflect actual test costs.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	11.712	1.482	-	-	-	0.000	13.194	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Joint Assault Bridge Development & Testing																												
Live Fire Test & Eval Force Protection Enhancements																												
Live Fire Remediation Testing																												
Live Fire Test & Eval																												
Production Qualification Test																												
Logistics Demonstration																												
Initial Operational Test & Eval																												
Full Rate Production																												
Armored Mobile Earthmover (AME)																												
AME - Analysis of Alternatives (AOA)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) EW8 / <i>Armored Engineer Vehicles</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Joint Assault Bridge Development & Testing	1	2016	1	2019
Live Fire Test & Eval Force Protection Enhancements	1	2017	3	2018
Live Fire Remediation Testing	1	2019	2	2019
Live Fire Test & Eval	4	2016	3	2018
Production Qualification Test	2	2018	1	2019
Logistics Demonstration	4	2018	1	2019
Initial Operational Test & Eval	2	2019	3	2019
Full Rate Production	1	2020	1	2020
Armored Mobile Earthmover (AME)	1	2018	4	2026
AME - Analysis of Alternatives (AOA)	2	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
G11: <i>Adv Elec Energy Con Ad</i>	-	4.982	6.331	3.338	-	3.338	3.201	3.405	3.201	3.328	0.000	27.786
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 by investigating technology insertions including, but not limited to hybrid capabilities, light-weight power solutions, vehicle/tactical microgrid interoperability. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment an operational energy concepts.

FY20 funding will continue to support the Small Tactical Electric Power (STEP), Power Distribution Illumination System, Electrical (PDISE) and Command Post Integrated Infrastructure (CPI2) programs.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Contract Activity	1.982	-	0.620	-	0.620
Description: Continue maturation and integration of technology supporting the STEP, CPI2 and PDISE programs.					
FY 2020 Base 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 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY20 efforts to build infrastructure prototypes to enable optimized use of existing microgrid technologies, build prototypes to integrate command post vehicle power with Tactical Electric Power systems, and build prototypes to validate feasibility of integrating energy storage with existing TEP systems accounted for the increase from FY19 which had no contract activity. This funding also is used to leverage external funding in collaborative efforts.					
<p>Title: Government System Test and Evaluation</p> <p>Description: Supports in house and external performance tests of concept hardware. Also supports evaluation of systems at Network Integration Evaluation (NIE). Also supports evaluation of systems at larger events such as AEWE and JWA.</p> <p>FY 2019 Plans: Continue evaluation and testing of various technologies related to tactical electric power and power distribution and management across the DoD power spectrum. Efforts will support the TEP CPD. Specific efforts will include performance testing of hybrid energy power sources.</p> <p>FY 2020 Base 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 funding is higher than FY19 funding to cover additional test, demonstration, and user feedback on available technologies that support hybrid and microgrid programs across the TEP spectrum. These efforts will gauge suitability and effectiveness of candidate technologies for follow-on development.</p>	0.400	0.200	1.048	-	1.048
<p>Title: Other Contracts and Government agencies</p> <p>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.</p> <p>FY 2019 Plans: Continue evaluation and testing of various technologies related to tactical electric power and power distribution and management across the DoD power spectrum. Efforts will be aimed at resolving technology gaps to meet Army User requirements. Efforts will support the TEP CPD. Specific efforts will include contract management and testing of hybrid/alternative energy power sources and power distribution/management system. Includes</p>	1.300	4.389	1.410	-	1.410

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
oversight, analysis and management of Operational Energy-related impacts, systems and improvements to reduce Army's energy dependence and improve operational capabilities. Includes \$3.0M Congressional add in support of tactical nuclear electric power program research for remote and forward operating bases. FY 2020 Base 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 technologies within small and medium power and operational use of microgrids. FY 2019 to FY 2020 Increase/Decrease Statement: FY20 is lower than FY19 due to one year congressional add in FY19.					
Title: Government Program Management Description: Continue development of technology supporting the STEP program, PDISE and CPI2. FY 2019 Plans: Oversight and management of various technology projects related to Tactical Electric Power and power distribution/management across the DoD power spectrum. Efforts will be aimed at resolving technology gaps to meet Army User requirements. Efforts will support the CPI2 Capabilities Development Document (CDD). Specific efforts will include support of CPI2, and power MDC systems. Oversight, analysis and management of Operational Energy-related impacts, systems and improvements to reduce Army's energy dependence and improve operational capabilities. FY 2020 Base 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 2019 to FY 2020 Increase/Decrease Statement: FY19 included additional management support due to ramped up support for the CPI2 program compared to FY20.	1.300	1.635	0.260	-	0.260
Title: FY 2019 SBIR/ STTR Transfer FY 2019 Plans:	-	0.107	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 SBIR/STTR Transfer					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SIBR/STTR transfer .					
Accomplishments/Planned Programs Subtotals	4.982	6.331	3.338	-	3.338

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 194: <i>Engine Driven Gen Ed</i>	6.513	1.801	8.395	-	8.395	15.485	14.475	14.163	7.810	0.000	68.642
• MA9800: <i>Generators And Associated Equip</i>	115.704	134.341	58.566	2.436	61.002	62.126	75.155	73.228	76.022	0.000	597.578

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 RDECOM efforts.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	0.733	0.082		0.175		0.054		-		0.054	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	PM E2S2 : Ft. Belvoir, VA	0.596	0.096		0.250		0.091		-		0.091	Continuing	Continuing	Continuing
Power Management and Distribution Systems	MIPR	PM E2S2 : Ft. Belvoir, VA	1.508	0.125		0.250		0.115		-		0.115	Continuing	Continuing	Continuing
Operational Energy	MIPR	PM E2S2 : Fort Belvoir, VA	1.528	0.132		0.150		-		-		-	Continuing	Continuing	Continuing
Subtotal			4.365	0.535		0.825		0.260		-		0.260	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Platoon Power Generation	MIPR	CERDEC : Fort Belvoir, VA	-	0.750		-		-		-		-	Continuing	Continuing	Continuing
Small Tactical Electric Power (STEP) Components	Various	CERDEC : Fort Belvoir, VA	3.281	0.750		0.300		0.104		-		0.104	Continuing	Continuing	Continuing
Hybrid Power Sources Components	Various	Multiple Vendors : TBD	2.370	0.305		0.200		0.183		-		0.183	Continuing	Continuing	Continuing
Power Management and Distribution Systems	Various	CERDEC : Fort Belvoir, VA	4.726	0.621		0.589		0.333		-		0.333	Continuing	Continuing	Continuing
Operational Energy	TBD	TBD : TBD (FY15)	2.409	0.500		0.249		-		-		-	Continuing	Continuing	Continuing
Metering and Monitoring Demo	Various	TBD : TBD	0.205	0.250		-		-		-		-	Continuing	Continuing	Continuing
FY 2019 SIBR/STTR Transfer	TBD	TBD : TBD	-	-		0.107		-		-		-	0.000	0.107	-
Subtotal			12.991	3.176		1.445		0.620		-		0.620	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Small Tactical Electric Power (STEP) Components	MIPR	CERDEC : Fort Belvoir, VA	1.706	0.168		0.385		0.250		-		0.250	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	CERDEC : Fort Belvoir, VA	1.721	0.098		-		0.450		-		0.450	Continuing	Continuing	Continuing
Power Management and Distribution Control Systems	MIPR	CERDEC : Fort Belvoir, VA	1.750	0.110		0.376		0.710		-		0.710	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	1.663	0.094		0.100		-		-		-	Continuing	Continuing	Continuing
Subtotal			6.840	0.571		3.861		1.410		-		1.410	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	1.130	0.200		0.200		0.453		-		0.453	Continuing	Continuing	Continuing
Hybrid Power Sources Components	MIPR	CERDEC : Fort Belvoir, VA	0.829	-		-		0.595		-		0.595	Continuing	Continuing	Continuing
Power Management and Distribution Systems	MIPR	CERDEC : Fort Belvoir, VA	1.761	0.250		-		-		-		-	Continuing	Continuing	Continuing

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
SMALL TACTICAL ELECTRIC POWER (STEP) PROGRAM																												
Assess Technologies, such as STEP, to Meet Gaps-STEP																												
Develop prototypes for modular, scalable STEP systems																												
Transfer to Engineering and Manufacturing Development-STEP																												
AMMPS Hybrid Power Integration																												
AMMPS Hybrid Technology Assessment																												
AMMPS Hybrid Prototype Development																												
AMMPS Hybrid Prototype Test and Evaluation																												
AMMPS Hybrid Transfer to AMMPS POR																												
PDISE Expansion																												
Test Technologies (Intelligent distro. controls) to Meet Gaps-PDISE Expansion																												
Develop and Test Ruggedized PDISE Expansion prototypes with AMMPS Microgrid																												
Transfer to Engineering and Manufacturing Development-PDISE Expansion																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
ASSESSMENT OF TECHNOLOGIES Across TEP line																												
Assess Technologies (remote start adapter) to Meet Gaps and																												
OPERATIONAL ENERGY (OE)																												
Evaluation of OE-Related Impacts, Systems and Improvemen																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) G11 / <i>Adv Elec Energy Con Ad</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SMALL TACTICAL ELECTRIC POWER (STEP) PROGRAM	1	2016	2	2021
Assess Technologies, such as STEP, to Meet Gaps-STEP	1	2016	2	2020
Develop prototypes for modular, scalable STEP systems	2	2020	2	2021
Transfer to Engineering and Manufacturing Development-STEP	2	2021	2	2021
AMMPS Hybrid Power Integration	1	2020	3	2022
AMMPS Hybrid Technology Assessment	1	2020	4	2020
AMMPS Hybrid Prototype Development	3	2019	3	2021
AMMPS Hybrid Prototype Test and Evaluation	3	2021	3	2022
AMMPS Hybrid Transfer to AMMPS POR	3	2022	4	2022
PDISE Expansion	1	2017	2	2023
Test Technologies (Intelligent distro. controls) to Meet Gaps-PDISE Expansion	1	2019	2	2020
Develop and Test Ruggedized PDISE Expansion prototypes with AMMPS Microgrid	1	2021	1	2023
Transfer to Engineering and Manufacturing Development-PDISE Expansion	2	2023	2	2023
ASSESSMENT OF TECHNOLOGIES Across TEP line	1	2017	4	2024
Assess Technologies (remote start adapter) to Meet Gaps and Improve Efficiencies	1	2017	4	2024
OPERATIONAL ENERGY (OE)	1	2016	4	2019
Evaluation of OE-Related Impacts, Systems and Improvements	1	2016	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
K39: <i>Field Sustainment Support Ad</i>	-	2.332	2.308	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.640
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Rapid Rigging and DeRigging Airdrop System (RRDAS) Phase I	1.821	1.277	-	-	-
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.					
FY 2019 Plans: Complete component evaluation in realistic airdrop environment and transition to Engineering and Manufacturing Development (EMD).					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Army efforts complete in FY19 and thereafter funding reallocated to support the Army's modernization priorities in support of the National Defense Strategy.					
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. FY 2019 Plans: Conduct evaluation of established ALVADS DRAS configuration in a realistic operational environment. Conduct Milestone C. FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and thereafter funding reallocated to support the Army's modernization priorities in support of the National Defense Strategy.	0.511	0.957	-	-	-
Title: SBIR/STTR FY 2019 Plans: SBIR/STTR FY 2019 to FY 2020 Increase/Decrease Statement: SBIR/STTR	-	0.074	-	-	-
Accomplishments/Planned Programs Subtotals	2.332	2.308	-	-	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• MA7806: <i>Precision Airdrop</i>	4.147	5.731	0.000	2.040	2.040	2.040	-	-	-	0.000	13.958
• L39: <i>Field Sustainment Support Ed</i>	4.750	2.220	1.675	-	1.675	1.720	1.773	1.807	1.800	0.000	15.745

Remarks

D. Acquisition Strategy
 Conduct pre-Engineering and Manufacturing Development (EMD) advanced component development to reduce risk prior to entering EMD phase.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>

<u>E. Performance Metrics</u> N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support	Various	PMFSS : Natick, MA	6.610	0.400		0.202		-		-		-	0.000	7.212	-
SBIR+STTR	TBD	Various : Various	0.090	-		0.074		-		-		-	0.000	0.164	-
Subtotal			6.700	0.400		0.276		-		-		-	0.000	7.376	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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	0.500	0.437		-		-		-		-	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	-		0.295		-		-		-	0.000	1.595	-
Subtotal			20.095	0.932		0.545		-		-		-	0.000	21.572	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JPADS Block 1 upgrade	Various	Various : Various	0.110	-		-		-		-		-	0.000	0.110	-
ALVADS-L/H DRAS	Various	Various : Various	0.050	0.250		-		-		-		-	0.000	0.300	-
Rapid Riggind/DeRigging	Various	Various : Various	-	0.200		-		-		-		-	0.000	0.200	-
Subtotal			0.160	0.450		-		-		-		-	0.000	0.610	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Conduct RRDAS Phase I market research and acquire prototype comp																												
Conduct RRDAS Phase I component development/integration																												
Conduct RRDAS prototype design, fabrication, and demonstration																												
Conduct ALVADS/DRAS feasibility study																												
Conduct ALVADS/DRAS baseline evaluations																												
Conduct ALVADS/DRAS prototype flight tests																												
Evalaute Integrated RRDAS technology																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K39 / <i>Field Sustainment Support Ad</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Conduct EHLSCDS validation testing	1	2016	1	2016
Conduct RRDAS Phase I market research and acquire prototype components	2	2018	3	2018
Conduct RRDAS Phase I component development/integration	3	2018	4	2018
JPADS Block I upgrade component development and risk reduction	1	2017	4	2017
Conduct RRDAS prototype design, fabrication, and demonstration	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>				Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
K41: <i>Water And Petroleum Distribution - Ad</i>	-	3.954	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.954
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project funding ends after FY 2018 to support the Army's modernization priorities in support of the National Defense Strategy.

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the potential of prototype equipment and technologies to satisfy petroleum storage, distribution, and quality surveillance system requirements. The Technology Development programs support the development and enhancement of rapidly deployable Petroleum and Water equipment. The mission includes developing fuel quality analysis systems; achieving greater capabilities in the removal of Nuclear, Biological, Chemical (NBC) and other contaminants from water sources; reducing the logistics footprint; alternative source water acquisition, reutilization and disposal systems to reduce the requirement for transport of water into the theater; water purification and waste water treatment and material systems to decrease the logistics footprint and employment time for the transfer of liquid logistics in joint operations area. This vital equipment enables the Army to achieve its mission by providing the the means to be highly mobile and self-sustaining in very hostile joint operations areas. Future Force operations demand that combat systems be rapidly deployable to the theater, rapidly emplaced upon arrival, and rapidly relocated to support a fast moving non-linear battlefield.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 3K Tactical Water Purification System (3K TWPS)	0.969	-	-	-	-
Description: The 3,000 (3k) Gallons per Hour (GPH) Tactical Water Purification System (TWPS) replaces the legacy 3,000 (3k) GPH Reverse Osmosis Water Purification Unit (ROWPU), which is currently the largest water purification capability in the Army's inventory and is nearing the end of its useful life. The 3k TWPS shall be the sole bulk water capability supporting Echelons Above Brigade (EAB) and will be the primary water purification capability for laundry and shower facilities. Purifies up to 3,000 GPH from any water source, including 60,000 mg/L Total Dissolved Solids (TDS) salt water and CBRN contaminated sources. Consists of feed water pumps, hoses, media and cartridge filters, high pressure pump, reverse osmosis elements, 3,000 gallon water storage and distribution system and control panel. Supports all tactical water missions LH S/PLS compatible via C HU/ E-CHU.					
Title: Early Entry Fluid Distribution System (E2FDS)	2.985	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: The Early Entry Fluid Distribution System (E2FDS) is a rapidly emplaced, high-throughput petroleum distribution conduit system. The E2FDS consists of 5-mile systems that can be connected to each other to form a pipeline trace up to 50 miles long. It can throughput 850,000 gallons of petroleum or 650,000 gallons of raw/non-potable water per day. E2FDS is emplacement at a rate of 25 miles per day and retrieved at a rate of 10 miles per day. The components are configured in stackable International Standards Organization (ISO) 20-foot equivalent units (TEU) for deployment and is Heavy Expanded Mobility Tactical Truck-Load Handling System (HEMTT-LHS), Palletized Load System (PLS) and PLS Trailer transportable. It includes a Command and Control Module (C2M) that allows for central control of the pipeline trace from a single location. The E2FDS complements the Inland Petroleum Distribution System (IPDS) by adding an early entry capability as well as a means for rapidly extending existing pipeline.					
Accomplishments/Planned Programs Subtotals	3.954	-	-	-	-

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>			<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• L41: <i>Water And Petroleum Distribution - Ed</i>	6.127	10.761	7.540	-	7.540	7.559	7.620	7.935	5.685	0.000	53.227
• MA6000: <i>Distribution Systems, Petroleum & Water</i>	41.622	26.471	74.867	13.986	88.853	76.583	54.169	27.142	37.552	0.000	352.392
• R67500: <i>PETROLEUM QUALITY ANALYSIS SYSTEM</i>	6.903	-	0.000	-	0.000	-	-	-	-	0.000	6.903

Remarks

D. Acquisition Strategy

Develop engineering prototypes for the 3K Tactical Water Purification System (3K TWPS), Army Fuels Automated Management System (AFAMS), and select Non-Development Item (NDI) based on market surveys and proposals from industry. Based on market research findings, award a competitive or sole source contract. Early Entry Fluid Distribution System (E2FDS) will conduct Developmental Testing (DT) and will test data to inform a fair opportunity decision for production. Army Fuels Automated Management System (AFAMS) sensors will require the development and testing of self-reporting sensors for all fuel storage tanks.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
3K Tactical Water Purification System (3K TWPS)	Various	TARDEC : Warren, MI	1.030	0.969		-		-		-		-	0.000	1.999	Continuing
Early Entry Fluid Distribution System (E2FDS)	C/FFP	DRS : West Plains, IL	5.888	-		-		-		-		-	Continuing	Continuing	Continuing
Subtotal			6.918	0.969		-		-		-		-	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Early Entry Fluid Distribution System (E2FDS)	MIPR	TARDEC & PM, PAWS : Warren, MI	3.147	-		-		-		-		-	0.000	3.147	Continuing
3K TWPS	MIPR	TARDEC : Warren, MI	0.273	-		-		-		-		-	0.000	0.273	-
Subtotal			3.420	-		-		-		-		-	0.000	3.420	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Modular Fuel System (MFS)	MIPR	Yuma Proving Ground : Yuma, AZ	0.750	-		-		-		-		-	0.000	0.750	Continuing
3K Tactical Water Purification System (3K TWPS)	MIPR	TARDEC : Warren, MI	1.312	-		-		-		-		-	0.000	1.312	Continuing
Early Entry Fluid Distribution System (E2FDS)	MIPR	Aberdeen Proving Ground : APG, MD	-	2.985		-		-		-		-	0.000	2.985	-
Subtotal			2.062	2.985		-		-		-		-	0.000	5.047	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
3K Tactical Water Purification System (3K TWPS)																												
3K TWPS Milestone B	1 MS B																											
3K TWPS Preliminary Design Review					5 PDR																							
3K TWPS CDR									9 CDR																			
3K TWPS Developmental Testing									DT																			
3K TWPS Milestone C													10 MS C															
3K TWPS Production Qualification Testing / Operational Testing																	PQT/OT											
Black Water Treatment (BWT)																												
Black Water Treatment Materiel Development Decision				3 MDD																								
Black Water Treatment Milestone B									6 MS B																			
Black Water Treatment Preliminary Design Review									7 PDR																			
Black Water Treatment Critical Design Review													11 CDR															
Black Water Treatment Development Testing													DT															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Early Entry Fluid Distribution System (E2FDS)																																
E2FDS Preliminary Design Review (PDR)		▲ 2 PDR																														
E2FDS Critical Design Review (CDR)				▲ 4 CDR																												
E2FDS Developmental Testing					DT																											
E2FDS Milestone C																																
E2FDS First Article Test / Initial Operational Testing													FAT/IOT																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) K41 / <i>Water And Petroleum Distribution - Ad</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
3K Tactical Water Purification System (3K TWPS)	4	2016	2	2022
3K TWPS Milestone B	2	2018	2	2018
3K TWPS Preliminary Design Review	1	2019	1	2019
3K TWPS CDR	1	2020	1	2020
3K TWPS Developmental Testing	3	2019	4	2019
3K TWPS Milestone C	3	2020	3	2020
3K TWPS Production Qualification Testing / Operational Testing	3	2021	3	2022
Black Water Treatment (BWT)	1	2019	1	2019
Black Water Treatment Materiel Development Decision	4	2018	4	2018
Black Water Treatment Milestone B	3	2019	3	2019
Black Water Treatment Preliminary Design Review	4	2019	4	2019
Black Water Treatment Critical Design Review	1	2022	1	2022
Black Water Treatment Development Testing	2	2021	4	2021
Early Entry Fluid Distribution System (E2FDS)	1	2017	4	2020
E2FDS Preliminary Design Review (PDR)	2	2018	2	2018
E2FDS Critical Design Review (CDR)	4	2018	4	2018
E2FDS Developmental Testing	1	2019	3	2019
E2FDS Milestone C	4	2019	4	2019
E2FDS First Article Test / Initial Operational Testing	1	2021	3	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
VR8: <i>Combat Service Support Systems - Ad</i>	-	3.334	3.218	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.552
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project VR8 completes in FY19

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Resource and Energy Efficiency Enabling Solutions	0.964	1.409	-	-	-
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.					
FY 2019 Plans: Conduct evaluation of integrated technologies that are transitioning from RDECOM 6.3 programs in a realistic operational environment utilizing the Base Camp Integration Laboratory (BCIL). Focus efforts on technologies that will make the greatest impact on reducing resource and operational energy demands of current and developing critical enabling soldier support and sustainment platforms that support multi-domain operations to include integrated Command Posts and expeditionary sustainment systems. Identify promising alternative					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
energy sources, renewable energy collection and storage capabilities for integration and conduct evaluations. Collect data from evaluations to inform and support Decision Points for transition into EMD. FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and funding thereafter reallocated to support the Army's modernization priorities in support of the National Defense Strategy.					
Title: Black Waste Elimination for Small Base Camps (150 personnel) Description: Provides the capability to reduce/eliminate the black water generated by small base camps. The objective capability will reduce our sustainment requirements for backhauling black waste water as well as our risk of contaminating the environment with biological contaminants. This capability will significantly reduce reliance on external support and is a key capability required to reduce sustainment requirements.	0.670	-	-	-	-
Title: Expeditionary Waste to Energy System Description: The Expeditionary Waste to Energy System reduces the operational energy and logistics footprint of the expeditionary base camp system with the goal of providing an integrated waste management and disposal process add-on capability that can safely process up to two tons of mixed solid organic waste in a single day on site with the energy associated with the management process being converted to usable energy in the form of fuel, heat and/or electric power. This capability will provide a safe and suitable means to dispose of waste in remote expeditionary base camps while reducing the fuel and power requirements to sustain operations in the field. This capability provides a substantial improvement over the current practice of burn pits and backhaul with associated vulnerabilities and safety issues.	0.200	-	-	-	-
Title: Army Standard Family of Soft Wall Shelters (ASF-SWS) Description: The ASF-SWS 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 SWS across the Services. The program will produce approved Technical Data Packages (TDPs) to support procurements by materiel developers and Program Managers (PMs) requiring SWS. ASF-SWS procurements are customer funded by PMs as a cost under their program(s). FY 2019 Plans:	-	0.891	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>		Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>		
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
No FY 2019 Plans as ASF-SWS program is not being funded in FY19. FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and funding thereafter reallocated to support the Army's modernization priorities in support of the National Defense Strategy.					
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 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. FY 2019 Plans: Award OTA Project for Expandable/Non-Expandable ASF-RWS Variant development. Conduct design, development, and prototype test items build for Expandable/Non-Expandable shelter variant. Initiate development of Technical Data Package (TDP) for Expandable/Non-Expandable shelter variant FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and funding thereafter reallocated to support the Army's modernization priorities in support of the National Defense Strategy.	1.500	0.815	-	-	-
Title: SBIR/STTR FY 2019 Plans: SBIR/STTR FY 2019 to FY 2020 Increase/Decrease Statement: SBIR/STTR	-	0.103	-	-	-
Accomplishments/Planned Programs Subtotals	3.334	3.218	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• VR7: <i>Combat Service Support Systems</i>	3.594	4.527	0.000	-	0.000	-	-	-	-	0.000	8.121

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support	Various	PM FSS : Natick, MA	1.847	0.429		0.365	Nov 2018	-		-		-	0.000	2.641	-
SBIR+STTR	TBD	various : Various	0.062	-		0.103		-		-		-	0.000	0.165	-
Subtotal			1.909	0.429		0.468		-		-		-	0.000	2.806	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Soldier Support Equipment	Various	Various : Various	8.057	2.050		-		-		-		-	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 Soft Wall Shelters (ASF-SWS)	Various	Various : Various	-	-		0.746	Mar 2019	-		-		-	0.000	0.746	-
Army Standard Family of Rigid Wall Shelters (ASF-RWS)	Various	Various : Various	-	-		0.295	Dec 2018	-		-		-	0.000	0.295	-
Subtotal			8.248	2.050		1.722		-		-		-	0.000	12.020	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Soldier Support Equipment	Various	Various : Various	4.795	0.855		-		-		-		-	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 Soft Wall Shelters (ASF-SWS)	Various	Various : Various	-	-		0.100	Mar 2019	-		-		-	0.000	0.100	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Conduct evaluation on resource & energy efficiency enabling sc																												
Conduct evaluation and demonstration of Black Waste Eliminati																												
Conduct technology assessment on Waste to Energy capabilitie																												
Evaluate integrated ASF-RWS technologies for all variants																												
Prepare for and conduct ASF-RWS Materiel Development Decis (D)																												
Prepare for Milestone B and transition ASF-RWS (Exp/Non-Exp) to EMD																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603804A / <i>Logistics and Engineer Equipment - Adv Dev</i>	Project (Number/Name) VR8 / <i>Combat Service Support Systems - Ad</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Conduct evaluation on resource & energy efficiency enabling solutions	1	2016	4	2019
Conduct evaluation and demonstration of Black Waste Elimination technologies	1	2016	4	2018
Complete and transition ESPS to EMD development	1	2015	3	2015
Evaluate Solid waste Disposal Technologies for small base camps	1	2017	4	2017
Conduct demonstration of ULCANS technology enhancements	1	2016	4	2017
Conduct technology assessment on Waste to Energy capabilities	1	2016	4	2018
Evaluate integrated ASF-RWS technologies for all variants	1	2016	4	2019
Prepare for and conduct ASF-RWS Materiel Development Decision (MDD)	3	2017	1	2018
Prepare for Milestone B and transition ASF-RWS (Exp/Non-Exp) to EMD	1	2019	2	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0603807A / Medical Systems - Adv Dev
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	36.279	39.244	31.175	-	31.175	30.785	35.315	26.491	27.500	0.000	226.789
808: DoD Drug & Vacc Ad	-	13.305	13.988	11.315	-	11.315	11.781	9.329	8.884	9.432	0.000	78.034
811: Mil HIV Vac&Drug Dev	-	5.022	5.289	5.460	-	5.460	5.603	5.973	1.110	1.146	0.000	29.603
836: Field Medical Systems Advanced Development	-	13.678	14.674	14.107	-	14.107	13.099	19.702	16.497	16.922	0.000	108.679
CS4: MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)	-	0.000	5.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.000
FF4: Counterdrug, DDR, Sys Development & Demonstration	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.000
VST: MEDEVAC Mission Equipment Package (MEP) - Adv Dev	-	0.274	0.293	0.293	-	0.293	0.302	0.311	0.000	0.000	0.000	1.473

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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	33.491	34.284	39.477	-	39.477
Current President's Budget	36.279	39.244	31.175	-	31.175
Total Adjustments	2.788	4.960	-8.302	-	-8.302
• Congressional General Reductions	-0.025	-0.040			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	4.000	-			
• SBIR/STTR Transfer	-1.187	-			
• Adjustments to Budget Years	-	-	-8.302	-	-8.302

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

Project: CS4: *MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)*

Congressional Add: *Transport Telemedicine*

	FY 2018	FY 2019
	-	5.000
Congressional Add Subtotals for Project: CS4	-	5.000
Congressional Add Totals for all Projects	-	5.000

Change Summary Explanation

Funding reduced in FY 2020 to support the Army's modernization priorities in support of the National Defense Strategy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>				Project (Number/Name) 808 / <i>DoD Drug & Vacc Ad</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
808: <i>DoD Drug & Vacc Ad</i>	-	13.305	13.988	11.315	-	11.315	11.781	9.329	8.884	9.432	0.000	78.034
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 2018	FY 2019	FY 2020
Title: DoD Drug and Vaccine Advanced Development	13.305	13.511	11.315
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 2019 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. Proposed solutions could be stand-alone treatments or adjuncts to established medical practice. Candidate treatments could be small-molecule drugs, biologicals such as bacteriophages, or antibodies.			
Next Generation Malaria Prophylaxis: Will continue the retinal (eye) safety study (3 year study) started in FY17. Address any FDA post-marketing approval requirements.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 808 / <i>DoD Drug & Vacc Ad</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Rapid Diagnostic and Detection Devices (Infectious Disease Diagnostics (Multiple)): The dengue and chikungunya assays will continue to be developed and evaluated. Clinical testing will be conducted for dengue and clinical sites identified for chikungunya.</p> <p>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.</p> <p>Treatment for Resistant Wound Infections: Will monitor technical maturity of candidate treatments for evidence of safety and efficacy in relevant animal models.</p> <p>Malaria Chemoprophylaxis ?Tafenoquine (formerly Next Generation Malaria Prophylaxis): Will continue the retinal (eye) safety study (3 year study) started in FY17. Address any FDA post-marketing approval requirements.</p> <p>Rapid Diagnostic and Detection Devices (Infectious Disease Diagnostics (Multiple)): The dengue assay transitioned to PE 0604807A Project 849 in FY19. The chikungunya assays will continue to be developed and evaluated. Clinical testing will be conducted for chikungunya.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease in FY20 to support the Army's modernization priorities in support of the National Defense Strategy.</p>			
<p>Title: FY19 SBIR/ STTR Transfer</p> <p>Description: FY19 SBIR/STTR Transfer</p> <p>FY 2019 Plans: FY19 SBIR/STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY19 SBIR/STTR Transfer</p>	-	0.477	-
Accomplishments/Planned Programs Subtotals	13.305	13.988	11.315

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

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 808 / <i>DoD Drug & Vacc Ad</i>
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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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Management Services Cost	Various	Not Applicable : Not applicable	21.565	2.480		2.411		0.724		-		0.724	Continuing	Continuing	Continuing
Medical Product Development Management Services Cost	PO	General Dynamics Information Technology, : Frederick MD	4.579	2.409		2.322		0.774		-		0.774	0.000	10.084	-
Subtotal			26.144	4.889		4.733		1.498		-		1.498	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Cost	Various	Not applicable : Not applicable	30.466	2.753		-		5.373		-		5.373	Continuing	Continuing	Continuing
Rapid Diagnostic and Detection Devices	C/Various	Inbios, Inc : Seattle WA	-	-		2.051		2.428		-		2.428	0.000	4.479	-
FY19 SBIR/ STTR Transfer	TBD	N/A : N/A	-	-		0.477		-		-		-	0.000	0.477	-
Subtotal			30.466	2.753		2.528		7.801		-		7.801	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Medical Product Development Support Cost	Various	Not Applicable : Not applicable	15.721	-		1.020		0.107		-		0.107	Continuing	Continuing	Continuing
Subtotal			15.721	-		1.020		0.107		-		0.107	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 808 / <i>DoD Drug & Vacc Ad</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Dengue Vaccine Block II Human Infection model studies																												
	FY16-FY20																											
Treatment for Resistant Wound Infections Antifungal Drug Phase 2																												
	FY16-FY19																											
D5P Next Generation Malaria Drug Phase 2 Safety trial																												
																	FY16-FY17											
Rapid Human Diagnostic Devices																												
	FY17-FY22																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 808 / <i>DoD Drug & Vacc Ad</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Dengue Vaccine Block II Human Infection model studies	1	2016	4	2021
Treatment for Resistant Wound Infections Antifungal Drug Phase 2 safety trial	1	2016	4	2020
D5P Next Generation Malaria Drug Phase 2 Safety trial	4	2021	4	2023
Rapid Human Diagnostic Devices	4	2017	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>				Project (Number/Name) 811 / <i>Mil HIV Vac&Drug Dev</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
811: <i>Mil HIV Vac&Drug Dev</i>	-	5.022	5.289	5.460	-	5.460	5.603	5.973	1.110	1.146	0.000	29.603
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 2018	FY 2019	FY 2020
Title: Military HIV Vaccine & Drug Development	5.022	5.095	5.460
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 2019 Plans: New components of the regional vaccine will be tested in FY19. This testing will determine if improved effectiveness can be achieved. This study will be conducted in three regions and is supported by the U.S. Army and DAIDS.			
The cohort studies in Thailand and Germany will be completed in FY19, with results available by the end of the FY. Selection of clinical sites for future effectiveness studies will be initiated.			
FY 2020 Plans: Regional Vaccine Candidate: Effort will not be funded in this BA until FY23 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 2019 to FY 2020 Increase/Decrease Statement: The increase of funding in FY20 was due to the inflation factor.			
Title: FY 2019 SBIR/ STTR Transfer	-	0.194	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 811 / <i>Mil HIV Vac&Drug Dev</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Description: FY19 SBIR/STTR Transfer			
FY 2019 Plans: FY19 SBIR/STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY19 SBIR/STTR Transfer			
Accomplishments/Planned Programs Subtotals	5.022	5.289	5.460

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Management Services Cost	TBD	Not Applicable : Not Applicable	3.280	0.852		-		-		-		-	Continuing	Continuing	Continuing
Subtotal			3.280	0.852		-		-		-		-	Continuing	Continuing	N/A

Remarks
Not Applicable

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Cost	TBD	Not applicable : Not applicable	4.081	0.997		-		-		-		-	Continuing	Continuing	Continuing
FY19 SBIR/STTR Transfer	TBD	N/A : N/A	-	-		0.194		-		-		-	0.000	0.194	-
Subtotal			4.081	0.997		0.194		-		-		-	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Support Cost	TBD	TBD : TBD	2.439	1.112		-		-		-		-	0.000	3.551	-
Subtotal			2.439	1.112		-		-		-		-	0.000	3.551	N/A

Remarks
Not Applicable

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development T&E Cost	TBD	Not applicable : Not Applicable	23.538	2.061		5.095		5.460		-		5.460	0.000	36.154	-
Subtotal			23.538	2.061		5.095		5.460		-		5.460	0.000	36.154	N/A

Remarks
Not Applicable

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	33.338	5.022	5.289	5.460	-	5.460	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 811 / <i>Mil HIV Vac&Drug Dev</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Global HIV (Ad26/Ad26+gp140) Phase 2B Clinical Trial					FY18-FY20																							
Global HIV (Ad26/Ad26+gp140) Phase 3 Efficacy Clinical Trial									FY20-FY23																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 811 / <i>Mil HIV Vac&Drug Dev</i>
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Schedule Details

Events	Start		End	
	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	2021
Global HIV (Ad26/Ad26+gp140) Phase 3 Efficacy Clinical Trial	4	2020	1	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
836: Field Medical Systems Advanced Development	-	13.678	14.674	14.107	-	14.107	13.099	19.702	16.497	16.922	0.000	108.679
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 2018	FY 2019	FY 2020
Title: Field Medical Systems Advanced Development - Program Management (PM) Medical Devices	10.991	8.249	2.982
Description: Advanced Concept Development funding is provided for the following development of medical devices in support of enhanced combat casualty care.			
FY 2019 Plans: Field Anesthesia: Will continue clinical trials and prototype comparison. Temporary Corneal Repair (TCR): Will continue down select activities. Extracorporeal Life Support ? Lung/Renal (formerly Portable ECMO): Will continue clinical trials and device refinement. NINAD: Will continue FDA clinical trial for the indication for use of diagnosing mild traumatic brain injury.			
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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 836 / <i>Field Medical Systems Advanced Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease in FY20 to support the Army's modernization priorities in support of the National Defense Strategy.</p>				
<p>Title: Field Medical Systems Advanced Development - PM Medical Support Systems</p> <p>Description: Funding is provided for efforts to develop products that support the medical mission in combat casualty care and health care operations.</p> <p>FY 2019 Plans: Nett Warrior Enhanced Wearable Sensors: Will continue to collaborate with Program Executive Office Soldier on the development of wearable sensors.</p> <p>Semi-autonomous casualty evacuation (CASEVAC) Ground Platform (S-MET): Will collaborate with PEO Combat Systems & Combat Support Systems on the Ground Mobility Vehicle Infantry Squad Variant (GMVISV).</p> <p>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.</p> <p>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</p> <p>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 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase of funding in FY20 is due to the planned progression of medical products under development including transport telemedicine.</p>		2.462	2.556	4.604
<p>Title: Field Medical Systems Advanced Development - PM Tissue Injury and Regenerative Medicine</p>		0.225	2.250	1.880

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 836 / <i>Field Medical Systems Advanced Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: Funding for engineering and manufacturing development of tissue injury and regenerative medicine health products for enhanced medical capability and readiness.</p> <p>FY 2019 Plans: Topical Burn Conversion Prevention Product: Will submit an Investigational Device Exemption, and will prepare for safety and effectiveness trials for a product to prevent superficial burn wounds from developing into deep partial and full thickness burn injuries.</p> <p>Systemic Burn Conversion Prevention Product: Will initiate manufacturing of material and Phase 2 clinical trial (safety and effectiveness) for a product used as an intravenous treatment in burn injuries.</p> <p>Permanent Acellular Arterial Graft: Will initiate manufacturing of material and a Phase 2 (safety and efficacy) clinical trial to support vascular grafting for extremity repair and reconstruction.</p> <p>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.</p> <p>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.</p> <p>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).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease in FY20 to support the Army's modernization priorities in support of the National Defense Strategy.</p>				
<p>Title: Field Medical Systems Advanced Development - PM Pharmaceutical Systems</p> <p>Description: Funding is provided for engineering and manufacturing development of medical products managed by Program Manager (PM) Pharmaceuticals for enhanced combat casualty care and follow-on care, including rehabilitation.</p> <p>FY 2019 Plans:</p>		-	1.121	4.641

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 836 / <i>Field Medical Systems Advanced Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Cold Stored Platelets in Platelet Additive Solution: Will complete studies for product characterization and labeling information and effectiveness.</p> <p>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. FY20 is a planned progression of medical products under development.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase of funding in FY20 is due to the planned progression of medical products under development.</p>			
<p>Title: FY 2019 SBIR/ STTR Transfer</p> <p>Description: FY19 SBIR/STTR Transfer</p> <p>FY 2019 Plans: FY19 SBIR/STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY19 SBIR/STTR Transfer</p>	-	0.498	-
Accomplishments/Planned Programs Subtotals	13.678	14.674	14.107

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Management Services Cost	Various	Not Applicable : Not applicable	44.935	1.009		0.974		0.996		-		0.996	Continuing	Continuing	Continuing
Medical Product Development Management Services Cost	C/IDIQ	Not applicable : Not applicable	1.200	-		1.185		-		-		-	0.000	2.385	-
Subtotal			46.135	1.009		2.159		0.996		-		0.996	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	TBD	TBD : TBD	0.932	-		-		-		-		-	0.000	0.932	-
Medical Product Development	TBD	ALL Product : Various	3.014	0.895		2.263		-		-		-	Continuing	Continuing	Continuing
Product Development of Freeze-dried plasma	TBD	TBD : TBD	8.778	-		-		-		-		-	Continuing	Continuing	Continuing
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	2.322	0.726		-		-		-		-	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	-
Noninvasive Neuromodulator TBI	TBD	TBD : TBD	2.036	2.241		-		-		-		-	0.000	4.277	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603807A / Medical Systems - Adv Dev				836 / Field Medical Systems Advanced Development							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PTSD	Various	TBD : Various locations	2.032	2.243		-		-		-		-	0.000	4.275	-
Temporary Corneal Repair	Various	TBD : TBD	2.479	2.561		-		2.364		-		2.364	0.000	7.404	-
Field Anesthesia	TBD	TBD : Various	2.568	3.205		1.020		-		-		-	0.000	6.793	-
Field Sterilizer	TBD	TBD : TBD	3.515	-		3.121		-		-		-	0.000	6.636	-
Product Development	TBD	HemCon Medical Technologies : Tigard, Oregon	9.720	-		-		-		-		-	Continuing	Continuing	Continuing
Product Development	TBD	Banyan BioMarkers, Inc : Alachua FL	31.514	-		-		-		-		-	Continuing	Continuing	Continuing
Development of Platelet Derived Hemostatic agent	TBD	Fast Track Drugs & Biologics : Frederick, MD	1.800	-		-		-		-		-	Continuing	Continuing	Continuing
Non-invasive neuro assessment device (NINAD)	C/Various	TBD : TBD	0.800	-		2.874		-		-		-	0.000	3.674	-
Cold Stored Platelets in Platelet Additive Solution (CSP-PAS) (Formerly Advanced Refrigerated Platel	C/Various	TBD : TBD	-	-		0.975		4.641		-		4.641	0.000	5.616	-
Transport Telemedicine Systems (TTS) - MEDHUB Platform (Formerly named Operational Virtual Health)	TBD	TBD : TBD	-	-		-		2.000		-		2.000	Continuing	Continuing	Continuing
Permanent Acellular Graft (formerly Extremity Injury Repair - Vascular Graft)	TBD	SS/CPFF : HumaCyte: Morrisville, NC	-	-		-		1.003		-		1.003	Continuing	Continuing	Continuing
Nett Warrior Enhanced Physiological Sensors (Wearable)	TBD	Various : Various	-	-		-		1.153		-		1.153	Continuing	Continuing	Continuing
FY19 SBIR/ STTR Transfer	TBD	N/A : N/A	-	-		0.498		-		-		-	0.000	0.498	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			90.421	11.871		10.751		11.161		-		11.161	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Support Cost	Various	Not Applicable : Not applicable	46.464	0.548		1.152		1.200		-		1.200	Continuing	Continuing	Continuing
Subtotal			46.464	0.548		1.152		1.200		-		1.200	Continuing	Continuing	N/A

Remarks
No product/contract costs greater than \$1M individually.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development T&E Cost	TBD	Not applicable : Not applicable	38.414	0.250		0.612		0.750		-		0.750	Continuing	Continuing	Continuing
Subtotal			38.414	0.250		0.612		0.750		-		0.750	Continuing	Continuing	N/A

Remarks
No product/contract costs greater than \$1M individually.

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			221.434	13.678	14.674	14.107	-	14.107	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 836 / <i>Field Medical Systems Advanced Development</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Temporary Corneal Repair	R&D development																											
Noninvasive Neuro Assessment Device development	R&D development																											
Cold Stored Platelets in Platelet Additive solution	R&D development																											
Transport Telemedicine Systems (TTS)- MEDHUB Platform	R&D development																											
Transport Telemedicine Systems (TTS)- MEDHUB Drug Safety	R&D development																											
Permanent Acellular Arterial Graft - Vascular Pivotal Study	R&D development																											
Permanent Acellular Arterial Graft - Vascular MS B	R&D development																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) 836 / <i>Field Medical Systems Advanced Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Temporary Corneal Repair	2	2016	1	2022
Noninvasive Neuro Assessment Device development	1	2017	1	2024
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
Permanent Acellular Arterial Graft - Vascular Pivotal Study	1	2021	3	2023
Permanent Acellular Arterial Graft - Vascular MS B	2	2021	2	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>				Project (Number/Name) CS4 / <i>MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
CS4: <i>MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)</i>	-	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	-	-	-	-	-	-	-	-	-	-		

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 2018	FY 2019
<i>Congressional Add:</i> Transport Telemedicine	-	5.000
<i>FY 2019 Plans:</i> Transport Telemedicine		
Congressional Adds Subtotals	-	5.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) CS4 / <i>MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Telemedicine product development (MEDHUB) - Develop MEDHUB F	[REDACTED]				[REDACTED]																							
Telemedicine product development (MEDHUB) - Peripheral Inte	[REDACTED]				[REDACTED]																							
Telemedicine product development (MEDHUB) - Software Deve	[REDACTED]				[REDACTED]																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) CS4 / <i>MEDICAL SYSTEMS ADV DEV INITIATIVES (CA)</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>				Project (Number/Name) FF4 / <i>Counterdrug, DDR, Sys Development & Demonstration</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>FF4: Counterdrug, DDR, Sys Development & Demonstration</i>	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.000
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 2018	FY 2019	FY 2020
Title: Counterdrug, DDR System Development	4.000	-	-
Accomplishments/Planned Programs Subtotals	4.000	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019			
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		

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Coding and Development Testing																												
User Testing																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) FF4 / <i>Counterdrug, DDR, Sys Development & Demonstration</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Coding and Development Testing	3	2017	1	2019
User Testing	1	2019	2	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
VS7: MEDEVAC Mission Equipment Package (MEP) - Adv Dev	-	0.274	0.293	0.293	-	0.293	0.302	0.311	0.000	0.000	0.000	1.473
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, model HH-60M. 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 2018	FY 2019	FY 2020
Title: Medical Evacuation Development	0.274	0.293	0.293
<p>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.</p> <p>FY 2019 Plans: Future Vertical Lift (FVL) Aeromedical Evacuation Cabin Space and Technology Research and Design (Medical Evacuation Development): Determine optimum space and configuration to perform life-saving paramedic-level tasks in current and future evacuation platforms. Will develop patient handling system components and prototypes to ensure paramedic skills and tasks are performed to standard to save Soldiers' lives during MEDEVAC Missions.</p> <p>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</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) VS7 / <i>MEDEVAC Mission Equipment Package (MEP) - Adv Dev</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
modernization of the UH60 helicopter medical interior system by reducing weight and designing modularity allowing greater mission flexibility.				
Accomplishments/Planned Programs Subtotals		0.274	0.293	0.293
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.				
E. Performance Metrics				
N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Management Services Cost	TBD	APM MEDEVAC : Huntsville, AL	0.189	0.129		0.293		0.161		-		0.161	0.000	0.772	-
Subtotal			0.189	0.129		0.293		0.161		-		0.161	0.000	0.772	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Cost	TBD	APM MEDEVAC PEO Aviation : Huntsville AL	1.479	0.145		-		0.132		-		0.132	0.000	1.756	-
Subtotal			1.479	0.145		-		0.132		-		0.132	0.000	1.756	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Medical Product Development Support Cost	TBD	APM MEDEVAC : Huntsville, AL	0.911	-		-		-		-		-	0.000	0.911	-
Subtotal			0.911	-		-		-		-		-	0.000	0.911	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>		Project (Number/Name) VS7 / <i>MEDEVAC Mission Equipment Package (MEP) - Adv Dev</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Future Vertical Lift (FVL) and UH60 Aeromedical Evac Cabin Sp	Research and development																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603807A / <i>Medical Systems - Adv Dev</i>	Project (Number/Name) VS7 / <i>MEDEVAC Mission Equipment Package (MEP) - Adv Dev</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Future Vertical Lift (FVL) and UH60 Aeromedical Evac Cabin Space and Technology	1	2017	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	60.774	31.022	22.113	-	22.113	26.161	30.974	33.992	28.562	Continuing	Continuing
CF2: <i>Integrated Soldier Systems Prototyping (SL CFT)</i>	-	0.000	0.000	1.959	-	1.959	2.543	3.152	3.774	3.847	0.000	15.275
ET8: <i>Personnel Airdrop System Development</i>	-	0.476	0.396	0.297	-	0.297	1.267	1.265	1.813	1.000	Continuing	Continuing
S53: <i>Clothing And Equipment</i>	-	2.532	1.823	2.466	-	2.466	1.810	2.416	4.478	5.078	Continuing	Continuing
S54: <i>Small Arms Improvement</i>	-	27.832	7.677	14.555	-	14.555	16.097	19.232	17.439	10.487	0.000	113.319
VS4: <i>Soldier Protective Equipment</i>	-	29.934	21.126	2.836	-	2.836	4.444	4.909	6.488	8.150	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 FY2050. The ASA will develop a metric-based approach that will include live, virtual and constructive evaluations and tools across the 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 of the airborne Soldier and increasing the performance, safety, 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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>
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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 Joint Service Small Arms Program (JSSAP), Project 627, Program Element 0603607A, (Budget Activity 3), 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	20.239	18.044	16.165	-	16.165
Current President's Budget	60.774	31.022	22.113	-	22.113
Total Adjustments	40.535	12.978	5.948	-	5.948
• Congressional General Reductions	-0.014	-0.022			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	35.000	13.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	6.248	-			
• SBIR/STTR Transfer	-0.699	-			
• Adjustments to Budget Years	-	-	5.948	-	5.948

Change Summary Explanation

FY 2018 funding includes a \$20.000 million congressional add for Project S54 and a \$15.000 million congressional add for Project VS4.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	
FY 2019 funding includes a \$13.000 million congressional add for Project VS4. FY 2020 funding request reflects an increase of \$5.948 million to account for the new start of Project CF2 and increased funding in Project S53.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>				Project (Number/Name) CF2 / <i>Integrated Soldier Systems Prototyping (SL CFT)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
CF2: <i>Integrated Soldier Systems Prototyping (SL CFT)</i>	-	0.000	0.000	1.959	-	1.959	2.543	3.152	3.774	3.847	0.000	15.275
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project CF2 is a new start beginning in FY 2020. This program supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

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 FY2050. The ASA will develop a metric-based approach that will include live, virtual and constructive evaluations and tools across the DoD, academia and industry which will be used for senior leaders to make deliberate decisions based on the analysis of Soldier/ Squad performance.

FY20 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 2018	FY 2019	FY 2020
Title: Integrated Soldier Systems Prototyping	-	-	1.959
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.			
FY 2020 Plans: FY 2020 Plans: Finalize operational version of ASA and SPM			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) CF2 / <i>Integrated Soldier Systems Prototyping (SL CFT)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
New start. Critical task of Adaptive Squad Architecture will be to allow Army Futures Command, Soldier Lethality Cross Functional Team, and PEO Soldier leadership to make immediate quantitative analysis of proposed components (ie next-gen weapons, future body-armor, etc) for acquisition.			
Accomplishments/Planned Programs Subtotals	-	-	1.959

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• CF3: <i>Integrated Soldier Systems (SL CFT)</i>	-	-	4.504	-	4.504	4.601	4.429	4.502	4.584	0.000	22.620

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.

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>		Project (Number/Name) CF2 / <i>Integrated Soldier Systems Prototyping (SL CFT)</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Soldier Lethality Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) CF2 / <i>Integrated Soldier Systems Prototyping (SL CFT)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Soldier Lethality Support	2	2020	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>				Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
ET8: <i>Personnel Airdrop System Development</i>	-	0.476	0.396	0.297	-	0.297	1.267	1.265	1.813	1.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

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 of the airborne Soldier and increasing the performance, safety, and durability of personnel airdrop equipment.

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

	FY 2018	FY 2019	FY 2020
Title: Personnel Airdrop System Development	0.476	0.396	0.297
Description: Effort to 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 capability of the airborne soldier and increasing the performance, safety and durability of personnel airdrop equipment.			
FY 2019 Plans: Continue to investigate and initiate improvements to address reduced signature of parachute systems for high altitude operations.			
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 2019 to FY 2020 Increase/Decrease Statement: Funding change in Personnel Airdrop System Development portfolio is due to anticipated requirement changes in FY 2019 and FY 2020.			
Accomplishments/Planned Programs Subtotals	0.476	0.396	0.297

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• ES9: <i>Advanced Tactical Parachute System</i>	5.607	6.702	6.617	-	6.617	1.829	2.965	2.964	3.000	0.000	29.684
• MA7801: <i>Advanced Tactical Parachute System</i>	28.440	41.104	43.622	-	43.622	53.077	47.805	39.849	39.017	0.000	292.914

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).

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental Contracts	C/FFP	TBD : TBD	-	-		-		0.098		-		0.098	2.605	2.703	-
Engineering Support	MIPR	NSRDEC Natick, MA : various	0.234	0.226		-		0.100		-		0.100	1.404	1.964	-
Subtotal			0.234	0.226		-		0.198		-		0.198	4.009	4.667	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Support	Allot	PM SCIE : Belvoir	0.180	0.065		0.040		0.099		-		0.099	1.336	1.720	-
Subtotal			0.180	0.065		0.040		0.099		-		0.099	1.336	1.720	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Bench top testing	MIPR	TBD : TBD	0.250	0.185		0.356		-		-		-	0.000	0.791	-
Subtotal			0.250	0.185		0.356		-		-		-	0.000	0.791	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		0.664	0.476	0.396	0.297	-	0.297	5.345	7.178	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Evaluate component and subsystem technologies	[Blue bar spanning FY 2018 Q1 to FY 2023 Q4]																											
RA-1 Signature Reduction Testing	[Blue bar spanning FY 2018 Q1 to FY 2020 Q4]																											
SL Canopy Release Assembly Testing	[Blue bar spanning FY 2023 Q1 to FY 2023 Q4]																											
Next Generation O2 Laboratory Testing	[Blue bar spanning FY 2023 Q1 to FY 2024 Q4]																											
Transition S&T for USL snap hook towed Jumper recovery system	[Blue triangle '2' at FY 2021 Q2]																											
Evaluate USL & Jumper Recovery Systems	[Blue bar spanning FY 2021 Q2 to FY 2021 Q3]																											
S&T transition of Alternative Materiel Hardware for RA-1, T-11 & MC-6	[Blue triangle '4' at FY 2022 Q4]																											
Evaluate new composite material for lighter weight parachute hardware	[Blue bar spanning FY 2021 Q3 to FY 2023 Q4]																											
Transition Parachutist Non-GPS Navigation Aid	[Blue triangle at FY 2024 Q4]																											
Evaluate Transition Parachutist Non-GPS Navigation Aid	[Blue bar spanning FY 2021 Q1 to FY 2024 Q4]																											
Transition High Altitude Combo Drops	[Blue triangle '3' at FY 2021 Q3]																											
Evaluate High Altitude Combo Drops	[Blue bar spanning FY 2021 Q3 to FY 2022 Q1]																											
Transition S&T for Low Altitude Static Line Automatic Activation Devices	[Blue triangle '1' at FY 2020 Q1]																											

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Evaluate Low Altitude Static Line Automatic Activation Devices																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) ET8 / <i>Personnel Airdrop System Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Evaluate component and subsystem technologies	1	2018	4	2023
RA-1 Signature Reduction Testing	1	2018	4	2020
SL Canopy Release Assembly Testing	1	2023	4	2023
Next Generation O2 Laboratory Testing	1	2023	3	2025
Transition S&T for USL snap hook towed Jumper recovery system	4	2021	4	2021
Evaluate USL & Jumper Recovery Systems	4	2021	2	2022
S&T transition of Alternative Materiel Hardware for RA-1, T-11 & MC-6	4	2022	4	2022
Evaluate new composite material for lighter weight parachute hardware	1	2022	4	2023
Evaluate Transition Parachutist Non-GPS Navigation Aid	1	2021	1	2026
Transition High Altitude Combo Drops	1	2022	1	2022
Evaluate High Altitude Combo Drops	1	2022	3	2022
Transition S&T for Low Altitude Static Line Automatic Activation Devices	2	2020	2	2020
Evaluate Low Altitude Static Line Automatic Activation Devices	2	2020	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S53 / <i>Clothing And Equipment</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>S53: Clothing And Equipment</i>	-	2.532	1.823	2.466	-	2.466	1.810	2.416	4.478	5.078	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

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.

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

	FY 2018	FY 2019	FY 2020
Title: Soldier Uniforms and Clothing	1.962	1.765	1.972
Description: Develop superior and sustainable integrated clothing for the Soldier in a rapidly changing global environment.			
FY 2019 Plans: Develop improved Boot Water Absorption test methodology. Evaluate improved lighter weight textiles which incorporate improved vector protection, FR protection, and environmental protection while providing comfort, utility, and functionality. Evaluate materials to support extreme cold temperature protection for military free fall parachutists. Standardize test methodology for cold weather glove system. Improve Hot Weather Combat Uniform Female (IHWCU-F) Pattern adjustment for creation of female sizes.			
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 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S53 / <i>Clothing And Equipment</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Funding change in Soldier Uniforms and Clothing portfolio is due to anticipated requirement changes in FY 2019 and FY 2020.			
Title: Individual Equipment 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. FY 2019 to FY 2020 Increase/Decrease Statement: Minor increase to support testing.	0.570	-	0.494
Title: FY 2019 SBIR/STTR TRANSFER Description: FY 2019 SBIR/STTR TRANSFER FY 2019 Plans: FY 2019 SBIR/STTR TRANSFER FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR TRANSFER	-	0.058	-
Accomplishments/Planned Programs Subtotals			
	2.532	1.823	2.466

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• S60: <i>Clothing & Equipment</i>	6.780	8.348	6.453	-	6.453	6.724	5.015	4.850	3.700	0.000	41.870

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 Systems Development and Demonstration. This Project continues to exercise competitively awarded contracts using best value source selection procedures.

E. Performance Metrics
 N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603827A / Soldier Systems - Advanced Development				S53 I Clothing And Equipment								
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Program Management Support	TBD	PM SPIE : Ft. Belvoir, VA	15.287	0.208		0.235		0.296		-		0.296	Continuing	Continuing	Continuing	
Subtotal			15.287	0.208		0.235		0.296		-		0.296	Continuing	Continuing	N/A	
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Engineering Support	MIPR	NSRDEC : Natick, MA	15.928	0.410		-		0.441		-		0.441	Continuing	Continuing	Continuing	
Development Contracts	C/FFP	Various : Various	33.725	0.724		-		0.588		-		0.588	Continuing	Continuing	Continuing	
FY 2019 SBIR /STTR Transfer	TBD	TBD : TBD	-	-		0.058		-		-		-	0.000	0.058	-	
Subtotal			49.653	1.134		0.058		1.029		-		1.029	Continuing	Continuing	N/A	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Misc Support Costs	MIPR	Natick,MA : Natick, MA	8.077	0.325		0.725		0.296		-		0.296	Continuing	Continuing	Continuing	
Subtotal			8.077	0.325		0.725		0.296		-		0.296	Continuing	Continuing	N/A	
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Testing Costs	MIPR	Various : Various	26.049	0.865		0.805		0.845		-		0.845	Continuing	Continuing	Continuing	
Subtotal			26.049	0.865		0.805		0.845		-		0.845	Continuing	Continuing	N/A	

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army								Date: March 2019			
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>				Project (Number/Name) S53 / <i>Clothing And Equipment</i>			
	Prior Years	FY 2018		FY 2019		FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	99.066	2.532		1.823		2.466	-	2.466	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S53 / <i>Clothing And Equipment</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024											
	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								
UNIFORM CLOTHING																																				
IHWCU-F																																				
Flame Resistant Clothing Upgrades																																				
Improve Signature Mgmt (IR) Eval & Camo in Clothing & Equ																																				
CW/ECW Clothing Improvements																																				
CW/ECW Handwear																																				
CW/ECW Footwear																																				
INDIVIDUAL EQUIPMENT																																				

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S53 / <i>Clothing And Equipment</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
UNIFORM CLOTHING	1	2010	4	2023
IHWCU-F	1	2020	4	2020
Flame Resistant Clothing Upgrades	1	2011	4	2023
Improve Signature Mgmt (IR) Eval & Camo in Clothing & Equipment	2	2012	4	2024
CW/ECW Clothing Improvements	1	2020	4	2022
CW/ECW Handwear	1	2020	4	2020
CW/ECW Footwear	1	2020	4	2020
INDIVIDUAL EQUIPMENT	4	2015	4	2018

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>S54: Small Arms Improvement</i>	-	27.832	7.677	14.555	-	14.555	16.097	19.232	17.439	10.487	0.000	113.319
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross Functional Team (CFT).

FY 2020 New starts include the following programs: Individual Non-Lethal System (funded in FY 2017), Non-Standard Weapons Assessments (funded in FY 2017), Solid State Active Denial System, Current and Legacy Weapon Improvements, and Next Generation Optics.

Name change: Next Generation Squad Automatic Rifle is renamed Next Generation Squad Weapon-Automatic Rifle (NGSW-AR) and Small Arms Fire Control (SAFC)-Squad combined with SAFC-Crew are now referred to as Next Generation Fire Control.

Previously funded efforts in this Project: Recoil Reduction Mechanisms, Lightweight Rifle/Machine Gun Barrel Evaluations, and Rifle/Machine Gun Suppressor Evaluations, Protective Weapons Coatings, and Weapon Upgrades and Accessories are now funded under Current and Legacy Weapon Improvements. Armaments for Robots is now funded under Externally Powered Weapon. Optics Upgrades is now covered under Next Generation Optics. Sniper Missed Distance Corrective Offset, Small Arms Fire Control Crew Enhancements, Small Arms Fire Control Precision Enhancements, and Fire Control Upgrades are now funded under Next Generation Fire Control.

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 Joint Service Small Arms Program (JSSAP), Project 627, Program Element 0603607A, (Budget Activity 3), 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 2018	FY 2019	FY 2020
Title: New Weapon Systems	21.200	0.800	2.505

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: Development of new small arms weapon systems</p> <p>FY 2019 Plans: Next Generation Squad Automatic Rifle (NGSAR): Transition of technologies from Program Element 0603827A, Project S54 to Program Element 0604601A, Project EW4. Coordinating and developing the Capability Development Document (CDD), Acquisition Strategy, Capability Production Document (CPD), and provide data from various technologies to better inform stakeholders. Beginning EMD phase for the Next Generation Squad Automatic Rifle.</p> <p>Externally Powered Mounted Machine Gun renamed to Externally Powered Weapon (EPW). Continuing to support the development of the Capability Development Document (CDD) with Maneuver Center of Excellence and Maneuver Support Center of Excellence. Intent is to leverage information gathered from prototype testing and develop a demonstrator to better evaluate and inform the CDD and the various platforms that may include the EPW as their Armament System.</p> <p>New Weapons Evaluations and Assessments: Continuing to perform initial evaluation and assessment of new weapons.</p> <p>FY 2020 Plans: Externally Powered Weapon (EPW): Will continue to support the development of the Capability Development Document (CDD) with Maneuver Center of Excellence and Maneuver Support Center of Excellence. Intend to leverage information gathered from prototype testing and develop a demonstrator to better evaluate and inform the CDD and the various platforms that may include the EPW as their Armament System. Will initiate 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.</p> <p>New Weapon Systems Evaluations and Assessments: Will continue to perform initial evaluation and assessment of new weapon systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 Increase in funds required to reduce technology risk and to determine the appropriate set of technologies required to complete the Next Generation Squad Weapons technology development phase.</p>				
<p>Title: Small Arms Weapon Systems Enhancements</p> <p>Description: Enhancements and developments of small arms weapon systems.</p> <p>FY 2019 Plans: Recoil Reduction Mechanisms: Continuing to assess and evaluate selected Recoil Reduction Mechanisms prototypes to be fabricated and tested for both individual and crew served weapons.</p>		-	0.100	7.650

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Armaments for Robots: Continuing to initiate 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.</p> <p>Increased Barrel Life/Replace Chrome: Continuing test and evaluation of prototype barrels delivered in FY 2017 to pursue barrel and liner designs that can withstand higher pressures per the Small Arms Ammunition Configuration Study outputs. Further investigate and mature additive manufacturing and cold spray methodology for barrels.</p> <p>Non-Standard Weapons Assessments: Continuing to conduct baseline testing of commercial weapon systems and perform capability analysis of unique weapon characteristics. Continuing 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 establish a sustainment strategy for long term support of weapons procured to support the Regionally Aligned Forces training mission. Continuing to conduct market research of commercially available weapon systems.</p> <p>Small Business Innovative Research Enhancements: Continuing to focus on improvements designed to enhance lethality, target acquisition and tracking, fire control, training effectiveness and reliability of weapons.</p> <p>Protective Weapons Coatings: (includes Adaptive Lubricious Coatings): Continuing to develop manufacturing technology to support production of super hydrophobic and other coatings in support of Small Arms Weapons. Assessing and evaluating current manufacturing process studies and assessments to adapt the coating technology into weapon Original Equipment Manufacturer manufacturing processes.</p> <p>Weapon Upgrades and Accessories: Continuing to test, evaluate and analyze ongoing and new activities to enhance small arms weapons.</p> <p>FY 2020 Plans: FY2020 New Start: Current and Legacy Weapon Improvements: Will assess and evaluate selected capabilities and improvements for all current and legacy weapon systems. FY2020 New Start: Solid State Active Denial System: Will work to complete maturation of design, continue to monitor status of Capability Development Document and provide input into programmatic documents as necessary. FY2020 New Start: Individual Non-Lethal System: Will work to complete maturation of design and get it ready for prove out test at Government facility in support of Milestone B. Previously funded in FY 2017.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>FY2020 New Start: 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 establish a sustainment strategy for long term support of weapons procured to support the Regionally Aligned Forces training mission. Continues to conduct market research of commercially available weapon systems. Previously funded in FY 2017.</p> <p>Small Business Innovative Research Enhancements: Will continue future efforts continues to focus on improvements designed to enhance lethality, target acquisition and tracking, fire control, training effectiveness and reliability of weapons.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 Increase in funds required to reduce technology risk and to determine the appropriate set of technologies required to complete the Next Generation Squad Weapons technology development phase.</p>			
<p>Title: Ammunition Description: Small arms ammunition improvement.</p> <p>FY 2019 Plans: Ammunition Upgrades: Continuing to evaluate the effect of new ammunition on small arms weapons.</p> <p>FY 2020 Plans: Ammunition Upgrades: Will continue to evaluate the effect of new ammunition on small arms weapon systems.</p>	-	0.100	0.100
<p>Title: Combat Optics Description: Improvement of small arms combat optics.</p> <p>FY 2019 Plans: Optics Upgrades: Continuing to evaluate state of the art advances in optical component technologies for inclusion in future products, including Mounted Machinegun Optic Capability Production Document, Fire Control Capability Development Document, and its associated annexes.</p> <p>FY 2020 Plans: FY2020 New Start: Next Generation Optics: Will integrate current and emerging target acquisition component technologies into a variable magnification spotting scope and into binoculars.</p>	0.508	0.100	0.100
<p>Title: Fire Control</p>	6.124	6.095	4.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

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

Description: Small arms fire control.

FY 2019 Plans:

FY 2019 New start: Next Generation Fire Control (Crew Served and Squad) Technology Enhancements: Continuing support and oversight for exploring future fire control applications for Next Generation Squad Weapons objective requirements, Small Business innovation Research, and digital enhancements. Future applications specifically address aim augmentation, target tracking and handoff, automatic target detection/identification/recognition, integrated day/night capability, integrated wind sensor, secure wireless transmission, environmental sensing, and optical enhancements.

Next Generation Spotting Scope: Continuing to consolidate readily available and mature fire-control/target acquisition component technologies into a variable magnification spotting scope.

Next Generation Binocular: Continuing to assess and evaluate incorporating existing target acquisition/fire control component technologies into binoculars.

Sniper Missed Distance Corrective Offset: Continuing to assess and evaluate from a sniper team (shooter's) location, tracks sniper's bullet trace to target to derive a missed distance correct offset for a follow-on shot.

Next Generation Fire Control: Continuing to conduct prototyping activities to advance fire control technologies on carbine and rifle weapon platforms. Will address Size, Weight, and Power trade space challenges associated with fire control on the individual squad weapons. Transitioning to Program Element 0604601A Project FF2 Small Arms Fire Control.

Small Arms Fire Control-Precision/Enhancements: Continuing to support and explore future precision fire control enhancements which includes: target detection to improve battlefield reconnaissance and intelligence gathering capabilities, improve target acquisitions at extended ranges in all battlefield conditions, improve anti-reflection (AR) coating to minimize scope glints, and counter optical augmentation that can disclose soldiers' location, target tracking, down range wind sensing technology, bullet tracking, weapon bore sensor, automated muzzle velocity tracker to improve fire control accuracy, far-target location, battlefield networking, and augmented reality. To provide support to Small Business Innovative Research efforts that will explore the feasibility, scientific merit, research and development, and commercialization of future Precision fire control system.

FY 2018	FY 2019	FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Fire Control Upgrades: Continuing to test advanced fire control systems for small arms platforms to define the acquisition strategy in support of the Capability Development Document consisting of individual weapons, sniper/precision, crew served weapons, low and high velocity 40mm.</p> <p>FY 2020 Plans: Next Generation Fire Control Technology Enhancements: Will continue 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 will have application in individual and crew served weapons to enhance and upgrade Fire Control.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 Increase in funds required to reduce technology risk and to determine the appropriate set of technologies required to complete the Next Generation Squad Weapons technology development phase.</p>				
<p>Title: Research and Analysis</p> <p>Description: Research and analysis of small arms.</p> <p>FY 2019 Plans: Continuing 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.</p> <p>FY 2020 Plans: Will continue 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.</p>		-	0.200	0.200
<p>Title: FY2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY2019 SIBR/STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 SIBR/STTR</p>		-	0.282	-
Accomplishments/Planned Programs Subtotals		27.832	7.677	14.555

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

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

Line Item	FY 2018	FY 2019	FY 2020	FY 2020	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Cost To	Total Cost
			Base	OCO	Total					Complete	
• EW4: <i>Crew Served Weapons Engineering Development</i>	12.999	11.102	2.589	-	2.589	15.767	14.789	13.927	9.029	0.000	80.202
• FF2: <i>Small Arms Fire Control</i>	17.914	10.188	21.463	-	21.463	10.163	11.254	8.000	10.000	0.000	88.982
• FI2: <i>Lightweight 30mm Cannon</i>	8.280	-	1.384	-	1.384	-	-	-	-	0.000	9.664
• FM4: <i>Next Generation Squad Weapons</i>	-	-	33.080	-	33.080	36.880	13.780	15.470	16.060	0.000	115.270
• S63: <i>Individual Weapons Engineering Development</i>	9.664	5.749	7.076	-	7.076	15.377	7.918	6.284	0.974	0.000	53.042
• FL4: <i>Small Caliber Ammo for Next Gen Squad Weapons</i>	-	-	22.880	-	22.880	30.630	28.750	25.000	11.750	0.000	119.010
• 627: <i>Jt Svc Sa Prog (JSSAP)</i>	5.628	5.879	0.000	-	0.000	-	-	-	-	0.000	11.507

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 enhancing/improving the small arms inventory.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603827A / Soldier Systems - Advanced Development				S54 / Small Arms Improvement							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Allot	PM Soldier Weapons, : Picatinny Arsenal	4.838	2.066	Mar 2018	0.570	Mar 2019	0.590	Mar 2020	-		0.590	Continuing	Continuing	Continuing
FY2019 SBIR / STTR Transfer	FFRDC	Army Budget Office : Pentagon, Washington DC	-	-		0.282	Nov 2018	-		-		-	Continuing	Continuing	Continuing
Subtotal			4.838	2.066		0.852		0.590		-		0.590	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Hardware Development	MIPR	Army Research Development Engineering Centers, : Multiple	11.375	22.348	Mar 2018	3.680	Mar 2019	9.755	Mar 2020	-		9.755	Continuing	Continuing	Continuing
Subtotal			11.375	22.348		3.680		9.755		-		9.755	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering	MIPR	Army Research Development Engineering Centers, : Multiple	24.780	2.271	Mar 2018	1.450	Mar 2019	2.240	Mar 2020	-		2.240	Continuing	Continuing	Continuing
Subtotal			24.780	2.271		1.450		2.240		-		2.240	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>				Project (Number/Name) S54 / <i>Small Arms Improvement</i>							
Test and Evaluation (\$ in Millions)															
				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Testing	MIPR	Army Test and Evaluation Centers, : Multiple	13.861	1.147	Mar 2018	1.695	Mar 2019	1.970	Mar 2020	-		1.970	Continuing	Continuing	Continuing
Subtotal			13.861	1.147		1.695		1.970		-		1.970	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			54.854	27.832		7.677		14.555		-		14.555	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
NEW WEAPON SYSTEMS																												
Next Generation Squad Weapon-Automatic Rifle																												
Next Generation Squad Weapon-Rifle																												
Externally Powered Weapon (EPW)																												
New Weapon Systems Evaluations and Assessments																												
SMALL ARMS WEAPON SYSTEMS ENHANCEMENTS																												
Solid State Active Denial System																												
Current and Legacy Weapon Improvements																												
Individual Non-Lethal System																												
Non-Standard Weapon Assessments																												
Small Business Innovative Research																												
Protective Weapons Coatings (includes Adaptive Lubricious C																												
Weapons Upgrades and Accessories																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024															
	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												
AMMUNITION																																								
Ammunition Upgrades																																								
COMBAT OPTICS																																								
Next Generation Optics																																								
Optics Upgrades																																								
FIRE CONTROL																																								
Next Generation Fire Control Technology Enhancements																																								
Next Generation Fire Control																																								
Small Arms Fire Control Precision/Enhancements																																								
Small Arms Fire Control Upgrades																																								
RESEARCH AND ANALYSIS																																								
Research and Analysis of Small Arms																																								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
NEW WEAPON SYSTEMS	1	2008	4	2024
Next Generation Squad Weapon-Automatic Rifle	1	2014	4	2019
Next Generation Squad Weapon-Rifle	2	2019	4	2020
Externally Powered Weapon (EPW)	1	2015	4	2021
New Weapon Systems Evaluations and Assessments	1	2017	4	2024
SMALL ARMS WEAPON SYSTEMS ENHANCEMENTS	1	2008	4	2024
Solid State Active Denial System	1	2020	4	2024
Current and Legacy Weapon Improvements	1	2020	4	2024
Individual Non-Lethal System	1	2020	4	2020
Non-Standard Weapon Assessments	1	2020	4	2024
Small Business Innovative Research	1	2015	4	2024
Protective Weapons Coatings (includes Adaptive Lubricious Coatings)	1	2016	4	2019
Weapons Upgrades and Accessories	1	2010	4	2019
AMMUNITION	1	2008	4	2023
Ammunition Upgrades	1	2016	4	2024
COMBAT OPTICS	1	2008	4	2024
Next Generation Optics	1	2020	4	2024
Optics Upgrades	1	2016	4	2019
FIRE CONTROL	1	2008	4	2024
Next Generation Fire Control Technology Enhancements	1	2019	4	2024
Next Generation Fire Control	1	2017	3	2019
Small Arms Fire Control Precision/Enhancements	1	2017	4	2019

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) S54 / <i>Small Arms Improvement</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
Small Arms Fire Control Upgrades	1	2008	4	2019
RESEARCH AND ANALYSIS	1	2012	4	2024
Research and Analysis of Small Arms	1	2015	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>				Project (Number/Name) VS4 / <i>Soldier Protective Equipment</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
VS4: <i>Soldier Protective Equipment</i>	-	29.934	21.126	2.836	-	2.836	4.444	4.909	6.488	8.150	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

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. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Soldier Protective Equipment (SPE)	29.934	20.828	2.836
Description: Effort to increase Warfighter lethality and mobility by optimizing Soldier protection while effectively managing all life cycle aspects of Personal Protective Equipment (PPE).			
FY 2019 Plans: Will continue Technology/Maturation and Risk Reduction efforts across the PPE portfolio to support the Soldier Protection System (SPS) requirements for lighter-weight ballistic materials with improved performance and manufacturing/testing process improvements. If ready, initiate proof-of-principle demonstrations on promising new and advanced materials, and in simulated and instrumented field exercises, evaluate upgrades and inform stakeholders of new operational capabilities. 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 2020 Plans: Project, 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. 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 durability, shelf life, and functional service life of existing personal			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) VS4 / <i>Soldier Protective Equipment</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
protective systems at the subsystem/component level. Continue the development of improved measurement processes for existing systems and emerging requirements. FY 2019 to FY 2020 Increase/Decrease Statement: Funding change in Soldier Protective Equipment portfolio is due to anticipated requirement changes in FY19 and FY20 that result in a reduced level of effort.			
Title: FY 2019 SBIR/STTR TRANSFER Description: FY 2019 SBIR/STTR TRANSFER FY 2019 Plans: FY 2019 SBIR/STTR TRANSFER FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR TRANSFER	-	0.298	-
Accomplishments/Planned Programs Subtotals	29.934	21.126	2.836

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

<u>Line Item</u>	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• VS5: <i>Soldier Protective Equipment</i>	1.725	6.050	6.627	-	6.627	8.327	9.666	9.490	8.507	0.000	50.392

Remarks

D. Acquisition Strategy
Programs pursue 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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603827A / Soldier Systems - Advanced Development				VS4 / Soldier Protective Equipment							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Allot	PM SPIE Various : Various	1.350	0.862		0.934		0.400		-		0.400	Continuing	Continuing	Continuing
Subtotal			1.350	0.862		0.934		0.400		-		0.400	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dev/Sys Engineering Spt	MIPR	Various : Various	8.059	0.443		0.400		0.750		-		0.750	Continuing	Continuing	Continuing
Dev/Integ Contracts	TBD	Various : Various	33.363	26.805		18.219		1.000		-		1.000	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.298		-		-		-	0.000	0.298	-
Subtotal			41.422	27.248		18.917		1.750		-		1.750	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Misc Support Costs	MIPR	Various : Various	3.925	0.832		0.662		0.200		-		0.200	Continuing	Continuing	Continuing
Subtotal			3.925	0.832		0.662		0.200		-		0.200	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Ballistic/Blast/Nonballistic Testing	MIPR	Various : Various	16.790	0.992		0.613		0.486		-		0.486	Continuing	Continuing	Continuing
Subtotal			16.790	0.992		0.613		0.486		-		0.486	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) VS4 / <i>Soldier Protective Equipment</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
SPS Technology Upgrade Insertion																												
TCEP Authorized Protective Eyewear (APEL) Update					▲ 3																							
VTP LRIP Production																												
VTP RFP Submission	▲ 1																											
VTP FRP Decision					▲ 4																							
VTP Technology Upgrade Insertion																												
TEP Technology Upgrade Insertion																												
Helmet Technology Upgrade Insertion																												
VTP SSEB																												
Next Gen IHPS Contract Award					▲ 2																							
Next Gen IHPS Deliveries																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603827A / <i>Soldier Systems - Advanced Development</i>	Project (Number/Name) VS4 / <i>Soldier Protective Equipment</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SPS Technology Upgrade Insertion	1	2017	4	2023
TCEP Authorized Protective Eyewear (APEL) Update	2	2019	2	2019
VTP LRIP Production	1	2017	1	2020
VTP RFP Submission	2	2018	2	2018
VTP FRP Decision	2	2019	2	2019
VTP Technology Upgrade Insertion	1	2020	4	2023
TEP Technology Upgrade Insertion	1	2020	4	2023
Helmet Technology Upgrade Insertion	1	2020	4	2023
VTP SSEB	3	2015	2	2019
Next Gen IHPS Contract Award	2	2019	2	2019
Next Gen IHPS Deliveries	2	2021	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	38.051	74.368	115.222	-	115.222	105.332	132.978	83.910	65.971	0.000	615.832
CF4: <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>	-	0.000	0.000	109.400	-	109.400	99.008	126.676	77.594	57.382	0.000	470.060
FD2: <i>Soldier Robotics Systems</i>	-	1.477	2.105	2.771	-	2.771	3.261	3.290	3.352	3.423	0.000	19.679
FD3: <i>Battery Modernization & Interface Standardization</i>	-	0.813	0.848	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.661
FD9: <i>Robotics Systems</i>	-	35.761	71.415	3.051	-	3.051	3.063	3.012	2.964	5.166	0.000	124.432

Note

In FY 2020 funding within this Program Element will transition/realign as follows:

- Project FD9 Robotics Systems: Robotic Combat Vehicle - Experimental Unit Prototypes (TARDEC) effort will remain in this PE but realign to Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT.
- Project FD9 Robotics Systems: Leader Follower efforts will transition to PE 0604622A Family of Heavy Tactical Vehicles Project EZ8, Leader Follower.

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, etc.) and by maturing/transiting 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) 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 robotic systems that are transported by vehicle and maneuver under their own power.

FY 2020 funding in the amount of \$1.258 million will support program management activities 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.

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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	
<p>support Operational Readiness at a reduced cost to the Army while maintaining configuration management, life cycle support, safety standards, and technological upgrades.</p> <p>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. 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. RDTE funds enable support to capability development of Tactical Wheeled Vehicle - Leader Follower (TWV-LF), Automated Convoy Operations (ACO), Dismounted Engineer Mobility System (DEMS), modular mission payloads, Route Clearance & Interrogation System (RCIS) Type II. 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 Robotic Combat Vehicle 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.</p> <p>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. Within RCV there are two major lines of effort executed in 3 phases: RCV Surrogate Experimental Unit Prototyping (Phase 1 & 2) and RCV Purpose Built Experimental Unit Prototyping (Phase 3). 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 Program of Record through Modeling and Simulation (M&S) development and initial prototype testing and iterative Soldier evaluations. This will stress the autonomy systems developed within the Science and Technology (S&T) base and ultimately reduce Program of Record testing requirements, technical risks, and costs through studies and validated simulations in addition to helping the Next Generation Combat Vehicle Cross Functional Team (NGCV CFT) refine their RCV requirements and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUMT) in combat relevant missions.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	39.608	95.660	15.677	-	15.677
Current President's Budget	38.051	74.368	115.222	-	115.222
Total Adjustments	-1.557	-21.292	99.545	-	99.545
• Congressional General Reductions	-0.031	-0.092			
• Congressional Directed Reductions	-	-21.200			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.526	-			
• Adjustments to Budget Years	-	-	99.545	-	99.545

Change Summary Explanation

The FY 2020 increase of \$73.845 million supports the Army's modernization priorities in support of the National Defense Strategy, to include experimental prototyping.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>				Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
CF4: <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>	-	0.000	0.000	109.400	-	109.400	99.008	126.676	77.594	57.382	0.000	470.060
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020, funding realigns from PE 0604017A Project FD9 Robotics Systems to PE 0604017A Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT. This is not a new start Project. This Project supports the Cross Functional Team (CFT).

A. Mission Description and Budget Item Justification

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. Within RCV there are two major lines of effort executed in 3 phases: RCV Surrogate Experimental Unit Prototyping (Phase 1 & 2) and RCV Purpose Built Experimental Unit Prototyping (Phase 3). 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 Program of Record through Modeling and Simulation (M&S) development and initial prototype testing and iterative Soldier evaluations. This will stress the autonomy systems developed within the Science and Technology (S&T) base and ultimately reduce Program of Record testing requirements, technical risks, and costs through studies and validated simulations in addition to helping the Next Generation Combat Vehicle Cross Functional Team (NGCV CFT) refine their RCV requirements and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUMT) in combat relevant missions.

In order to accelerate user involvement with RCV platform capabilities, the RCV Surrogate Experimental Unit Prototyping effort will be executed through a two (2) phase activity. The RCV surrogate platform build (Phase 1) was initiated in FY19 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 MUMT evaluations. Lessons learned from the platoon experiment will inform development of the purpose built RCV platforms (Phase 3) as well as inform S&T investment to help close gaps identified in unmanned vehicle performance. In order to conduct larger scale MUMT maneuvers and to continue to advance the autonomous performance of the robotic platforms, two additional platoons of surrogate RCVs will be built leveraging existing contractor unmanned platforms for a total of a company set (12) RCV. The surrogate 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 with a representative operational formation and will provide a test bed for the latest autonomous capabilities developed in S&T.

The RCV Purpose Built Experimental Unit Prototyping line of effort (Phase 3) will develop and produce innovative, unmanned platforms that take advantage of being designed specifically for unmanned combat operations such as reduced platform size and improved mobility. The intent is to award a minimum of two contracts to design and build up to a company of twelve (12) RCV platforms for user evaluation and experimentation starting at the end of FY 2022. 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 Purpose Built RCV platform requirements will be informed by the initial surrogate platoon experimentation (Phase

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>
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1) and Soldier feedback. The surrogate company experimentation (Phase 2) will inform how the purpose built RCVs will be used in a representative formation as well as reducing risk on critical software enabled capabilities such as the latest autonomous behaviors, mission command of multiple RCVs in an effective MUMT formation and Soldier control stations for RCV. Ultimately the purpose of this line of effort is to determine if RCV is ready to enter a rapid acquisition program of record or if the capability needs more development before it is operationally effective.

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

	FY 2018	FY 2019	FY 2020
<p>Title: Robotic Combat Vehicle ? Prototype Platforms</p> <p>Description: Robotic Combat Vehicle (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 Concepts of Operations (CONOPS) and new requirements for unmanned combat vehicles to 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 ATEC safety release and ultimately for Soldier evaluation through iterative User experimentation.</p> <p>FY 2020 Plans: In FY 2020, contracts for surrogate RCVs (Phase 2) using existing platforms will be awarded to up to two (2) contractors based off of requirements generated from a platform evaluation funded under PE 0605053A Ground Robotics, Project FB7 Robotics Enhancement Program (REP). Surrogate RCV platforms will focus on reconnaissance and decisive lethality mission roles. Direct fire, missile systems and advanced sensors will be integrated on to the platforms designed for remote operation. Remote mobility functions will be improved and autonomy sensor suite will be integrated to ensure safety critical operation for ATEC safety assessment in FY 2021. These platforms will be 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. In addition, based on the results of Phase 1 experimentation (see RCV Test and Evaluation bullet below), a competitive contract will be awarded to up to two (2) industry partners to initiate designs of a purpose built RCV for award in 4QFY2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding for Robotic Combat Vehicle realigns from PE 0604017A Robotics Development, Project FD9 Robotics Systems to PE 0604017A Robotics Development, Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT. This is not a new start Project.</p>	-	-	89.180
<p>Title: Robotic Combat Vehicle ? Modeling and Simulation</p> <p>Description: Robotic Combat Vehicle (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 experimentation in the RCV Campaign of Learning as well as feed initial data to the Requirements</p>	-	-	7.270

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Community as they build new manned-unmanned teaming (MUMT) 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.</p> <p>FY 2020 Plans: This effort will conduct 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 BCT formations. The models will be based upon input from industry science advisory groups to inform near-term art-of-the-possible. Soldier feedback on how to implement that will be assessed to help inform the purpose built prototype and evaluate capability sets in platoon level force-on-force simulation experimentation.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding for Robotic Combat Vehicle realigns from PE 0604017A Robotics Development, Project FD9 Robotics Systems to PE 0604017A Robotics Development, Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT. This is not a new start Project.</p>				
<p>Title: Robotic Combat Vehicle ? Testing and Evaluation</p> <p>Description: Robotic Combat Vehicle (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.</p> <p>FY 2020 Plans: RCV Risk Reduction effort will complete safety testing on the integrated Phase 1 surrogate M113 platforms. Following safety testing, the surrogate platforms begin the Soldier MUM-T Experimentation to get User assessment on the performance of the vehicles and to begin CONOP and TTP development based on actual system performance. Surrogate RCV platforms will be 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding for Robotic Combat Vehicle realigns from PE 0604017A Robotics Development, Project FD9 Robotics Systems to PE 0604017A Robotics Development, Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT. This is not a new start Project.</p>		-	-	7.170
<p>Title: Robotic Combat Vehicle ? Program Management</p>		-	-	5.780

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Description: Robotic Combat Vehicle (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.</p> <p>FY 2020 Plans: This effort will manage all activity under the RCV line of effort to include but not limited to government and contractor labor, travel, supplies, equipment and facilities. Manage RCV concept development, analysis, and modeling and simulation of RCV concepts. Manage detailed design, build integration, and evaluation of the RCV platform solutions. Manage the execution of the Phase 1 testing and operational experimentation.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2020, funding for Robotic Combat Vehicle realigns from PE 0604017A Robotics Development, Project FD9 Robotics Systems to PE 0604017A Robotics Development, Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT. This is not a new start Project.</p>			
Accomplishments/Planned Programs Subtotals	-	-	109.400

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

N/A

Remarks

D. Acquisition Strategy

Robotic Combat Vehicle (RCV) Experimental Unit Prototyping 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 achievable, analytically backed basis for future RCV requirements documents to drive future acquisition programs. Opportunity to take advantage of rapid acquisition processes if experimental prototypes meet soldier expectations which would get unmanned ground combat vehicles quicker into the field. Decision point in FY23 on decisive lethality path forward for the Army which determines if RCV is ready to enter rapid acquisition or needs additional development.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604017A / Robotics Development				CF4 / Robotic Combat Vehicle (RCV) NGCV-CFT							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Robotic Combat Vehicle - Program Management	MIPR	Various : Various	-	-		-		5.780	Oct 2019	-		5.780	15.550	21.330	-
Subtotal			-	-		-		5.780		-		5.780	15.550	21.330	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
RCV Surrogate Platform Built (Company Set)	C/CPFF	TBD : TBD	-	-		-		75.900	Oct 2019	-		75.900	25.300	101.200	-
RCV Purpose Built Platform (Company Set)	C/CPFF	TBD : TBD	-	-		-		13.280	Aug 2020	-		13.280	222.850	236.130	-
Subtotal			-	-		-		89.180		-		89.180	248.150	337.330	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
RCV Modeling and Simulation	MIPR	TBD : TBD	-	-		-		7.270	Oct 2019	-		7.270	10.820	18.090	-
RCV Test and Evaluation	MIPR	TBD : TBD	-	-		-		7.170	Oct 2019	-		7.170	28.780	35.950	-
Subtotal			-	-		-		14.440		-		14.440	39.600	54.040	N/A
Project Cost Totals			-	-		0.000		109.400		-		109.400	303.300	412.700	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV)</i> NGCV-CFT

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024					
	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		
Robotic Combat Vehicle (RCV)																														
Phase I Vehicle Safety Testing and Safety Release																														
RCV Phase I - Soldier Operational Exercise																														
RCV Phase II – Vehicle Design																														
RCV Phase II – Vehicle Integration / Build																														
RCV Phase II – Vehicle Shakedown Testing																														
RCV Phase II – Vehicle Safety Testing and Safety Release																														
RCV Phase II – Soldier Operational Exercise																														
RCV Phase III - Contracting																														
RCV Phase III – Vehicle Design																														
RCV Phase III – Vehicle Integration / Build																														
RCV Phase III – Vehicle Shakedown Testing																														
RCV Phase III – Vehicle Safety Testing and Safety Release																														

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV)</i> NGCV-CFT

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
RCV Phase III – Soldier Operational Exercise																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) CF4 / <i>Robotic Combat Vehicle (RCV)</i> NGCV-CFT

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Robotic Combat Vehicle (RCV)	1	2020	2	2020
Phase I Vehicle Safety Testing and Safety Release	1	2020	2	2020
RCV Phase I - Soldier Operational Exercise	2	2020	2	2020
RCV Phase II ? Vehicle Design	1	2020	3	2020
RCV Phase II ? Vehicle Integration / Build	2	2020	4	2020
RCV Phase II ? Vehicle Shakedown Testing	4	2020	1	2021
RCV Phase II ? Vehicle Safety Testing and Safety Release	2	2021	3	2021
RCV Phase II ? Soldier Operational Exercise	4	2021	4	2021
RCV Phase III - Contracting	3	2020	4	2020
RCV Phase III ? Vehicle Design	4	2020	3	2021
RCV Phase III ? Vehicle Integration / Build	2	2021	2	2022
RCV Phase III ? Vehicle Shakedown Testing	2	2022	3	2022
RCV Phase III ? Vehicle Safety Testing and Safety Release	4	2022	1	2023
RCV Phase III ? Soldier Operational Exercise	2	2023	2	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>				Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FD2: <i>Soldier Robotics Systems</i>	-	1.477	2.105	2.771	-	2.771	3.261	3.290	3.352	3.423	0.000	19.679
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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, 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) 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 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 2020 funding in the amount of \$1.258 million will support program management activities 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.

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.

Soldier Exoskeleton 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.

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

	FY 2018	FY 2019	FY 2020
Title: Soldier Borne Sensor (SBS) / Exoskeleton	0.330	1.483	1.513
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			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans: 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. 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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding change due to economic adjustment.</p> <p>Title: UGV Soldier Robotics Development</p> <p>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.</p> <p>FY 2019 Plans: Develop initial program cost estimates, conduct market surveys, perform/update Analysis of Alternatives (AoA) or letter of sufficiency, perform risk reduction activities and maturation technology efforts, initiate milestone documentation and prepare Request for Proposal (RFP).</p> <p>FY 2020 Plans:</p>				
		1.147	0.573	1.258

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase due to additional robotics development requirements.			
Title: FY 2019 SBIR / STTR Transfer	-	0.049	-
Description: SBIR / STTR			
FY 2019 Plans: SBIR / STTR			
FY 2019 to FY 2020 Increase/Decrease Statement: Adjusted for FY 2019 SBIR / STTR transfer.			
Accomplishments/Planned Programs Subtotals	1.477	2.105	2.771

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• FB8: <i>Soldier Borne Sensor (SBS)</i>	2.197	3.465	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• W63798: <i>Soldier Borne Sensor (SBS)</i>	24.000	21.680	23.362	-	23.362	25.927	11.160	19.101	25.293	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.

Initial Exoskeleton efforts will focus on prototyping emerging Industry and DoD Exoskeleton initiatives, assessing their performance through demonstrations and Soldier feedback that will inform capability requirement definition and subsequent materiel develop decision. These initiatives may range from Commercial-Off-The Shelf (COTS) solutions to developmental efforts.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
UGV Program Management Support	MIPR	Multiple : Multiple	-	0.418	Mar 2018	0.390	Feb 2019	0.400	Oct 2019	-		0.400	0.000	1.208	Continuing
SBS and Exoskeleton Program Management Support	Various	Various : Multiple	-	0.330	Jul 2018	1.483	Mar 2019	1.513	Mar 2020	-		1.513	0.000	3.326	Continuing
Subtotal			-	0.748		1.873		1.913		-		1.913	0.000	4.534	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
AoA CRS(H)	MIPR	Multiple : Various	-	0.258	Jun 2018	-		-		-		-	0.000	0.258	-
AoA ERP	MIPR	Multiple : Various	-	0.421	Apr 2018	0.098	Feb 2019	-		-		-	0.000	0.519	-
AoA CRS(LR)	MIPR	Multiple : Various	-	-		0.085	Feb 2019	-		-		-	0.000	0.085	-
Payload maturation and integration	Various	Various : Multiple	-	-		-		0.429	Dec 2019	-		0.429	0.000	0.429	-
Capability Development Studies	Various	Various : Multiple	-	-		-		0.429	Dec 2019	-		0.429	0.000	0.429	-
JCAUS IOP V4	MIPR	ARDEC : Picatinny, NJ	-	0.050	Sep 2018	-		-		-		-	0.000	0.050	-
FY 2019 SBIR /STTR Transfer	TBD	TBD : TBD	-	-		0.049	Oct 2018	-		-		-	0.000	0.049	-
Subtotal			-	0.729		0.232		0.858		-		0.858	0.000	1.819	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	1.477	2.105	2.771	-	2.771	0.000	6.353	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
UGV Robotics Development (ERP, CBRN, CRS-LR, etc.)																												
SBS MDD																												
SBS Analysis of Alternatives / Letter of Sufficiency																												
SBS Market Survey																												
SBS Request for Proposal (Development/Staffing)																												
SBS RFP Release Decision																												
SBS SSEB																												
SBS MS B/C																												
SBS Studies/Analysis																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD2 / <i>Soldier Robotics Systems</i>
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Schedule Details

Events	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>				Project (Number/Name) FD3 / <i>Battery Modernization & Interface Standardization</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FD3: <i>Battery Modernization & Interface Standardization</i>	-	0.813	0.848	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.661
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2018 funding for Unmanned Ground Vehicles (UGV) Robotics Development (RD) transitioned from PE 0604641A Tactical Unmanned Ground Vehicle, Project DV7 Small Unmanned Ground Vehicle to PE 0604017A Robotics Development, Project FD2 Soldier Robotics Systems, and funding for Applique and Large Unmanned Ground Systems (ALUGS) Robotics Development (RD) transitioned from PE 0604641A Tactical Unmanned Ground Vehicles, Project DV7 Small Unmanned Ground Vehicle to PE0604017A Robotics Development, Project FD9 Robotics Systems.

A. Mission Description and Budget Item Justification

Note: Project Battery Modernization & Interface Standardization complete in FY19.

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 2018	FY 2019	FY 2020
Title: Acquisition Strategy	0.212	0.210	-
Description: Complete advanced development pre-milestone B assessments and analysis.			
FY 2019 Plans: Finalize advanced development technology assessments and analysis. Conduct C-E battery analysis of market research/ Requests for Information (RFI). Develop Acquisition Strategy for the BMIS program.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD3 / <i>Battery Modernization & Interface Standardization</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Army efforts complete in FY19 and thereafter funding reallocated to support the Army's modernization priorities in support of the National Defense Strategy.				
<p>Title: BMIS Standard Family of Batteries (SFoB) Design</p> <p>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.</p> <p>FY 2019 Plans: Finalize the C-E Battery technology assessment. Determine a solid and integrated core Standard Family of Batteries to include batteries for generators and hybrids, robotics, vehicles, and low density/usage systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Army efforts complete in FY19 and thereafter funding reallocated to support the Army's modernization priorities in support of the National Defense Strategy.</p>		0.601	0.638	-
Accomplishments/Planned Programs Subtotals		0.813	0.848	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
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.				
E. Performance Metrics				
N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0604017A / Robotics Development				FD3 / Battery Modernization & Interface Standardization								
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
BMIS Design	Various	Various : Fort Belvoir	-	0.269		0.272		-		-		-	0.000	0.541	-	
Subtotal			-	0.269		0.272		-		-		-	0.000	0.541	N/A	
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
BMIS SFoB Prototype Development	Various	Various : Fort Belvoir, VA	-	0.332		0.371		-		-		-	0.000	0.703	-	
Subtotal			-	0.332		0.371		-		-		-	0.000	0.703	N/A	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
BMIS Program Support	Various	Various : Fort Belvoir	-	0.212		0.205		-		-		-	0.000	0.417	-	
Subtotal			-	0.212		0.205		-		-		-	0.000	0.417	N/A	
Project Cost Totals			-	0.813		0.848		-		-		-	0.000	1.661	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD3 / <i>Battery Modernization & Interface Standardization</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Battery & Interface Technical Assessment & Prototype Development																												
Battery Portfolio Assessment/Design																												
C-E Battery Tech Assessment/Adv Prototype																												
C-E Battery Requirements Analysis																												
Vehicle-Generator Battery Tech Assessment/Adv Prototype																												
Army Standard Family of Batteries (SFoB) Updates																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD3 / <i>Battery Modernization & Interface Standardization</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>				Project (Number/Name) FD9 / <i>Robotics Systems</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FD9: <i>Robotics Systems</i>	-	35.761	71.415	3.051	-	3.051	3.063	3.012	2.964	5.166	0.000	124.432
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY20 funding within this Project will transition/realign as follows:

- Robotic Combat Vehicle - Experimental Unit Prototypes (TARDEC) will remain in this PE 0604017A, but realign to Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT.
- Leader Follower efforts will transition to PE 0604622A Family of Heavy Tactical Vehicles Project EZ8, Leader Follower.

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. 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 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.

Funding also 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 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 2018	FY 2019	FY 2020
Title: Tactical Wheeled Vehicle - Leader Follower (TWV-LF) - RD for PdM Applique & Large Unmanned Ground Systems (ALUGS)	6.959	6.650	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Description: Tactical Wheeled Vehicle (TWV) Leader Follower (LF) Program in PdM Applique & Large Unmanned Ground Systems (ALUGS) builds upon the Tank Automotive Research Development & Engineering Center (TARDEC) Expedient Leader Follower (ELF) Operational Technology Demonstration (OTD) to provide a limited automation capability to the Palletized Load System (PLS) A1. Current PdM efforts will lay the groundwork for future Program of Record (PoR) capability, expanding the TARDEC 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 monitoring 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).</p> <p>FY 2019 Plans: FY19 funding supported the capability development of incremental technology insertions for Program of Records (PoR), technology transitions, testing, and milestone document preparation. Modeling and Simulation (M&S) development and initial prototype testing will refine the system performance to meet required Tactical Wheeled Vehicle- Leader Follower (TWV-LF) system capabilities. Development of a TWV-LF Software Integration Lab (SIL), in addition to M&S efforts, will stress the TWV-LF systems and ultimately reduce Program of Record testing requirements, technical risks and costs through validated simulations. Supports capability development of RCIS Type II, Dismounted Engineer Mobility System (DEMS), and other emerging programs.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, Leader Follower (LF) transitions to funding line 0604622A Family of Heavy Tactical Vehicles Project EZ8 Leader Follower. The initiation of the new Project EZ8 for LF causes the decrease from \$7.002 million in FY 2019 to \$0 in FY 2020.</p>			
<p>Title: Tactical Wheeled Vehicle - Leader Follower - Tank Automotive Research Development & Engineering Center (TARDEC) Tech Demo</p> <p>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 TARDEC Tech Demo, the applique kit provides a designated 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.</p> <p>FY 2019 Plans: FY 2019 funding continued the fabrication and testing of up to 140 Leader Follower PLS A1 vehicles for user operational assessment in FORSCOM identified units. Systems will go through an Army Test and Evaluation Command (ATEC) safety</p>	28.802	42.330	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
assessment and plan for Urgent Materiel Release based on the signed Leader Follower Directed Requirement. The issued Leader Follower systems will go through a 12 month Operational Technology Demonstration on CONUS installations to provide user feedback and assessment on the truck performance to inform a future milestone decision for a follow on Leader Follower program of record. Funding supports Robotic Combat Vehicle - Robotic Wingman (RCV-RW) Joint Capabilities Technology Demonstration (JCTD).				
FY 2019 to FY 2020 Increase/Decrease Statement: This effort ends in FY19 and transitions to PE 0604622A Family of Heavy Tactical Vehicles Project EZ8 Leader Follower in FY20.				
Title: Emerging Robotics Systems		-	2.298	3.051
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 2019 Plans: Funding supports Systems Engineering, Requirements, Cost Analysis and Technology Transition Plans, Software Integration Lab (SIL), and Robotic Combat Vehicle - Robotic Wingman (RCV-RW) Joint Capabilities Technology Demonstration (JCTD) transition to Program of Record. This will include cost, schedule and performance risk reduction efforts (e.g. M&S environment development). Funding also supports Squad Multipurpose Equipment Transport (SMET) Modular Mission Payloads (MMP) and Automation Concept Development.				
FY 2020 Plans: FY2020 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 2019 to FY 2020 Increase/Decrease Statement: Funding increase supports all emerging Robotic programs and increased Validation and Verification.				
Title: Robotic Combat Vehicle ? Experimental Unit Prototypes - Tank Automotive Research Development & Engineering Center (TARDEC)		-	16.840	-
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				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans: RCV Phase 1 Surrogate Experimentation effort will install by-wire kits onto four (4) M113 and one Stryker vehicles to enable them to be operated remotely. Remote Weapon Stations (both small and medium caliber) and advanced sensors will be integrated onto unmanned platforms to enable computer aided target recognition and remoted lethality on the RCVs. The surrogate RCVs will be completed by the end of FY19 for integration with autonomy package and follow on shake out and safety testing.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY20, funding realigns to PE 0604017A / Project CF4 Robotic Combat Vehicle (RCV) NGCV-CFT.</p>	-	3.297	-
<p>Title: FY 2019 SBIR/STTR Transfer</p> <p>FY 2019 Plans: SBIR/STTR</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Adjusted for FY 2019 SBIR/STTR Transfer</p>			
Accomplishments/Planned Programs Subtotals	35.761	71.415	3.051

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).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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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 TARDEC Expedient Leader Follower (ELF) Operational Technology Demonstration (OTD) to provide a limited autonomous vehicle capability to Tactical Wheeled Vehicles including the Palletized Load System (PLS) A1. Efforts include Capabilities Document input, close monitoring 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. 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.

Tank Automotive Armaments Research Development & Engineering Center (TARDEC) 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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PM FP PdM ALUGS	Allot	PM FP : Warren, MI	-	2.350		1.025	Nov 2018	0.500	Oct 2019	-		0.500	0.000	3.875	-
RCIS Type II ALUGS	MIPR	PdM ALUGS : Warren, MI	-	0.500		0.725	Oct 2018	-		-		-	0.000	1.225	-
Subtotal			-	2.850		1.750		0.500		-		0.500	0.000	5.100	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
RCV/ACO M&S SIL ALUGS	MIPR	TARDEC : 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 (TARDEC) Tech Demo A Kit	C/CPFF	Robotic Research : Baltimore, MD	-	10.400		11.000	Oct 2018	-		-		-	0.000	21.400	-
Leader Follower (TARDEC) Tech Demo B Kit	C/CPFF	Oshkosh : Oshkosh, WI	-	9.402		12.500	Dec 2018	-		-		-	0.000	21.902	-
Leader Follower (TARDEC) Integrated System Integrator	C/CPFF	Lockheed Martin : Dallas, TX	-	4.500		4.500	Oct 2018	-		-		-	0.000	9.000	-
Leader Follower (TARDEC) Warfighter Machine Interface	C/CPFF	DCS Corp : Boston, MA	-	2.500		3.000	Nov 2018	-		-		-	0.000	5.500	-
RCV Risk Reduction Platform Development	C/CPFF	To Be Determined : To Be Determined	-	-		16.840	Nov 2018	-		-		-	0.000	16.840	-
RD M&S SIL ALUGS	MIPR	TARDEC and various : Warren, MI	-	-		-		1.540	Oct 2019	-		1.540	0.000	1.540	-
FY2019 SBIR/STTR Transfer	TBD	Various : Various	-	-		3.297		-		-		-	0.000	3.297	-
Subtotal			-	26.802		53.237		1.540		-		1.540	0.000	81.579	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PdM ALUGS Support	MIPR	Various : Multiple locations	-	4.109		4.398	Oct 2018	1.011	Oct 2019	-		1.011	0.000	9.518	-
SMET Modular Mission Payloads ALUGS	MIPR	PdM ALUGS : Warren, MI	-	-		0.550	Oct 2018	-		-		-	0.000	0.550	-
Technology Demo support (TARDEC)	MIPR	TARDEC : Warren, MI	-	1.000		2.100	Oct 2018	-		-		-	0.000	3.100	-
Subtotal			-	5.109		7.048		1.011		-		1.011	0.000	13.168	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Leader Follower (TARDEC) Tech Demo Testing	MIPR	ATEC : Aberdeen, MD	-	0.500		0.200	Oct 2018	-		-		-	0.000	0.700	-
Leader Follower (TARDEC) Tech Demo Data Logger	MIPR	ATEC : Aberdeen, MD	-	0.500		0.200	Oct 2018	-		-		-	0.000	0.700	-
Leader Follower (TARDEC) Testing	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	-	-		7.830	Dec 2018	-		-		-	0.000	7.830	-
Leader Follower (TARDEC) Data Logger	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	-	-		1.000	Dec 2018	-		-		-	0.000	1.000	-
PdM ALUGS RD ATEC support	MIPR	ATEC : Aberdeen, MD	-	-		0.150	Nov 2018	-		-		-	0.000	0.150	-
Subtotal			-	1.000		9.380		-		-		-	0.000	10.380	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
LEADER FOLLOWER ALUGS																												
LF ALUGS MODELING & SIMULATION (M&S)																												
LF M&S																												
LF M&S Initial Capability Development																												
LM M&S Initial Development																												
LF Improve M&S Functionality & increase utility																												
LF Improve M&S functionality																												
LF M&S continued testing																												
LF M&S cont. testing																												
LF M&S Use Case Development																												
LF M&S Use Case Dev																												
LF M&S Validation, Verification Accreditation																												
LF Ver/Val/Accreditation																												
LF Milestone C Documentation																												
LF MS C Document Preparation																												
ALUGS Emerging Systems Upgrades																												
RD Emerging Systems Capability Upgrade Validation and Verification																												
RD Emerging systems V&V																												
TARDEC LEADER FOLLOWER Operational Technology Demonstration (OTD)																												
TARDEC LF Applique Prototype Build (10) for test																												
Applique Prototype Build & Integration (10)																												
TARDEC LF Order Items for 140 Applique Systems																												
Long Lead Item Order (140)																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
TARDEC LF Contractor Engineering Test					Contractor Test																							
ATEC LF Urgent Material Release (UMR) & Safety Test (TARDEC)									ATEC test																			
TARDEC LF Applique Build (140) for Tech Demo									Build Excursion Applique Systems (140)																			
TARDEC LF Urgent Material Release (UMR)													1 UMR															
TARDEC LF First Unit of Issue													2 FUI															
TARDEC LF Tech Demo Assessment													Evaluate LF systems in FORSCOM units															
Robotic Combat Vehicle (RCV) Risk Reduction																												
RCV Experimental Unit Prototyping - Contract Award									RCV Experimental Unit Prototyping - Contract Award																			
RCV Risk Reduction - M113 By-Wire Integration									RCV RR - M113 By-Wire Integration																			
RCV Risk Reduction - Unmanned M113 Shake Out Testing													RCV RR - Unmanned M113 Shake Out Testing															
RCV Risk Reduction - ATEC Safety Testing									RCV RR - ATEC Safety Testing																			
RCV Risk Reduction - Advanced Technology Demonstration													RCV RR - Advanced Technology Demonstration															
Robotic Combat Vehicle (RCV) Experimental Unit Prototyping																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
RCV Experimental Unit Prototyping - Industry Mobility Platform Prototypes																												
RCV EUP - Industry Mobility Platform Prototypes																												
RCV Experimental Unit Prototyping - Industry Lethality Systems Prototypes																												
RCV EUP - Industry Lethality Systems Prototypes																												
RCV Experimental Unit Prototyping - Industry AiTR System Prototypes																												
RCV EUP - Industry AiTR System Prototypes																												
RCV Experimental Unit Prototyping - Prototype Evaluation and Runoff																												
RCV EUP - Prototype Evaluation and Runoff																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
LEADER FOLLOWER ALUGS	1	2017	4	2022
LF ALUGS MODELING & SIMULATION (M&S)	1	2017	4	2020
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	2020
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	2019
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	2020
TARDEC LEADER FOLLOWER Operational Technology Demonstration (OTD)	3	2018	3	2022
TARDEC LF Applique Prototype Build (10) for test	3	2018	4	2018
TARDEC LF Order Items for 140 Applique Systems	3	2018	4	2018
TARDEC LF Contractor Engineering Test	3	2018	2	2019
ATEC LF Urgent Material Release (UMR) & Safety Test (TARDEC)	2	2019	3	2020
TARDEC LF Applique Build (140) for Tech Demo	2	2019	4	2019
TARDEC LF Urgent Material Release (UMR)	1	2020	1	2020
TARDEC LF First Unit of Issue	1	2020	1	2020
TARDEC LF Tech Demo Assessment	1	2020	2	2021
Robotic Combat Vehicle (RCV) Risk Reduction	4	2019	4	2021
RCV Experimental Unit Prototyping - Contract Award	1	2019	1	2019
RCV Risk Reduction - M113 By-Wire Integration	1	2019	4	2019

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / <i>Robotics Development</i>	Project (Number/Name) FD9 / <i>Robotics Systems</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
RCV Risk Reduction - Unmanned M113 Shake Out Testing	4	2019	2	2020
RCV Risk Reduction - ATEC Safety Testing	2	2020	4	2020
RCV Risk Reduction - Advanced Technology Demonstration	4	2020	4	2021
Robotic Combat Vehicle (RCV) Experimental Unit Prototyping	1	2019	4	2023
RCV Experimental Unit Prototyping - Industry Mobility Platform Prototypes	1	2019	4	2020
RCV Experimental Unit Prototyping - Industry Lethality Systems Prototypes	1	2019	4	2020
RCV Experimental Unit Prototyping - Industry AiTR System Prototypes	1	2019	4	2020
RCV Experimental Unit Prototyping - Prototype Evaluation and Runoff	4	2020	1	2021

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0604020A / Cross Functional Team (CFT) Advanced Development & Prototyping
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	9.488	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
CF1: CFT Advanced Development & Prototyping	-	0.000	9.488	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	38.000	174.699	-	174.699
Current President's Budget	0.000	9.488	0.000	-	0.000
Total Adjustments	0.000	-28.512	-174.699	-	-174.699
• Congressional General Reductions	-	-0.012			
• Congressional Directed Reductions	-	-28.500			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-174.699	-	-174.699

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity
2040: *Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)*

R-1 Program Element (Number/Name)
PE 0604020A / *Cross Functional Team (CFT) Advanced Development & Prototyping*

Change Summary Explanation

The decrease between the previous President's Budget and the Current President's Budget reflects a restructure of CFT funding.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
CF1: CFT Advanced Development & Prototyping	-	0.000	9.488	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project is a new start in FY19.

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 2018	FY 2019	FY 2020
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).			
FY 2019 Plans: Will conduct experimental prototyping and technical demonstrations to enable the development of Initial Capability Document (ICD) development in support of Enhanced Night Vision Goggles, Enhanced Defense Advanced Global Positioning System			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604020A / <i>Cross Functional Team (CFT) Advanced Development & Prototyping</i>	Project (Number/Name) CF1 / <i>CFT Advanced Development & Prototyping</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Receiver (DAGR) Distribution Device, and network and user assessments of Command Post (CP) Mobility and Survivability capabilities. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease is due to realignment of funding to 0604541A Unified Network Transport.			
Title: FY19 SBIR STTR FY 2019 Plans: n/a- tax FY 2019 to FY 2020 Increase/Decrease Statement: SBIR STTR Tax now accounted for	-	1.263	-
Accomplishments/Planned Programs Subtotals	-	9.488	-

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

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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
CFT Experimental Prototyping and technology demonstrations	TBD	Various : various	-	-		8.225		-		-		-	0.000	8.225	-
SBIR SITTR	TBD	SBIR STTR : n/a	-	-		1.263		-		-		-	0.000	1.263	-
Subtotal			-	-		9.488		-		-		-	0.000	9.488	N/A

Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	9.488	-	-	-	9.488	N/A

Remarks
Contracting will be conducted through Other Transactional Agreements or through FAR Part 12 Commercial Acquisition.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604020A / <i>Cross Functional Team (CFT) Advanced Development & Prototyping</i>	Project (Number/Name) CF1 / <i>CFT Advanced Development & Prototyping</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Cross Functional Teams																												
Analysis of Technical Solutions																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604020A / <i>Cross Functional Team (CFT) Advanced Development & Prototyping</i>	Project (Number/Name) CF1 / <i>CFT Advanced Development & Prototyping</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Cross Functional Teams	3	2019	1	2021
Analysis of Technical Solutions	3	2019	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0604021A / Electronic Warfare Technology Maturation (MIP)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	18.043	-	18.043	18.800	0.000	0.000	0.000	0.000	36.843
AW7: Electronic Warfare Technology Maturation (MIP)	-	0.000	0.000	18.043	-	18.043	18.800	0.000	0.000	0.000	0.000	36.843

Note

This program is a new start in FY 2020.

A. Mission Description and Budget Item Justification

Terrestrial Layer System (TLS) is a new start effort in FY 2020 to provide Army maneuver forces integrated Signals Intelligence (SIGINT), Electronic Warfare (EW), and offensive Cyber-enabling integrated solution to support Multi Domain operation capability gaps and provide Force Protection, Situational Development, and Information Superiority to the maneuver forces. TLS is a dedicated, all weather, 24/7, ground-based tactical system providing Signals Intelligence (SIGINT), Electronic Warfare Support (ES), Electronic Attack (EA) and Cyber enabling capabilities to support the Brigade Combat Team (BCT) and Expeditionary-Military Intelligence Brigade (E-MIB) commanders. TLS 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 dismounted, vehicle mounted, and extended range operations that can be efficiently sustained and effectively upgraded to provide capabilities against changing near peer and emerging threats.

B. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	18.043	-	18.043
Total Adjustments	0.000	0.000	18.043	-	18.043
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	18.043	-	18.043

Change Summary Explanation

This program is a new start in FY 2020.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604021A / <i>Electronic Warfare Technology Maturation (MIP)</i>				Project (Number/Name) AW7 / <i>Electronic Warfare Technology Maturation (MIP)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AW7: <i>Electronic Warfare Technology Maturation (MIP)</i>	-	0.000	0.000	18.043	-	18.043	18.800	0.000	0.000	0.000	0.000	36.843
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
PE 0604021A and Project AW7 for Terrestrial Layer System (TLS) is a new start in FY 2020.

A. Mission Description and Budget Item Justification

This is a new start in FY 2020. Terrestrial Layer System (TLS) is the overarching effort to provide Army maneuver forces integrated Intelligence, Electronic Warfare, and Cyber Warfare-enabling Capabilities. TLS is a dedicated, all weather, 24/7, ground-based tactical system providing Signals Intelligence (SIGINT), Electronic Warfare Support (ES), Electronic Attack (EA) and Cyber enabling capabilities to support the Brigade Combat Team (BCT) and Expeditionary-Military Intelligence Brigade (E-MIB) commanders. TLS provides, but is not limited to; Indications and Warnings, Force Protection and Situational Awareness to influence the commander's decision cycle, improves targeting timeliness and accuracy, and provides 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 dismounted, vehicle mounted, and extended range operations that can be efficiently sustained and effectively upgraded over its lifecycle to incorporate emerging technologies in order to pace near peer and emerging threats.

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

	FY 2018	FY 2019	FY 2020
Title: Technical / Program Management	-	-	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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 is the first year funding is programmed to support the TLS effort.			
Title: Systems Engineering and Component Prototyping	-	-	15.761
Description: Funds will provide for, but are not limited to evaluation, development and engineering 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 of system level design and integration to reduce Size, Weight and Power (SWaP) in order to mature components into an emerging Program of Record (PoR) level			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604021A / <i>Electronic Warfare Technology Maturation (MIP)</i>	Project (Number/Name) AW7 / <i>Electronic Warfare Technology Maturation (MIP)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
technology maturation level. Additionally, funding will support continuing component and system improvements through the establishment of a developmental test environment.			
<i>FY 2020 Plans:</i> Conduct analysis 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.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 is the first year funding is programmed to support the TLS effort.			
Accomplishments/Planned Programs Subtotals	-	-	18.043

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• FJ5: <i>Terrestrial Layer System (MIP)</i>	-	-	0.000	-	0.000	37.000	51.300	21.000	12.100	0.000	121.400

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 ground 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 enhanced capabilities and extended range alternative solutions. These efforts will quantify the respective maturity and effectiveness to mitigate capability gaps against changing near peer representative enemy target sets and operational scenarios. Enhanced capability, extended range and other technologies to provide overmatch capabilities will be evaluated for merit and will provide increased performance for production of TLS systems in FY2022. The TLS program will leverage all authorities to accelerate delivery.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604021A / <i>Electronic Warfare Technology Maturation (MIP)</i>	Project (Number/Name) AW7 / <i>Electronic Warfare Technology Maturation (MIP)</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Systems Engineering and Prototyping	C/Various	TBD : TBD	-	-		-		15.761	Feb 2020	-		15.761	0.000	15.761	-
Subtotal			-	-		-		15.761		-		15.761	0.000	15.761	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Technical / Program Management	C/CPFF	AASKI Technology : Tinton Falls, NJ	-	-		-		1.141	Nov 2019	-		1.141	0.000	1.141	-
Technical / Program Management	MIPR	Various Matrix Support Organizations : Aberdeen Proving Grounds, MD	-	-		-		1.141	Nov 2019	-		1.141	0.000	1.141	-
Subtotal			-	-		-		2.282		-		2.282	0.000	2.282	N/A

Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
-	-	0.000	18.043	-	18.043	0.000	18.043	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604021A / <i>Electronic Warfare Technology Maturation (MIP)</i>	Project (Number/Name) AW7 / <i>Electronic Warfare Technology Maturation (MIP)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
TLS Competitive Component Prototyping Award(s)									▲ 1																							
TLS System Engineering and Prototyping																																
TLS Integration/Production Contract Award																					▲ 2											
TLS Integration																																
TLS Rapid Production/Fielding																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604021A / <i>Electronic Warfare Technology Maturation (MIP)</i>	Project (Number/Name) AW7 / <i>Electronic Warfare Technology Maturation (MIP)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
TLS Competitive Component Prototyping Award(s)	2	2020	2	2020
TLS System Engineering and Prototyping	2	2020	2	2021
TLS Integration/Production Contract Award	2	2021	2	2021
TLS Integration	2	2021	2	2022
TLS Rapid Production/Fielding	2	2022	2	2027

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604100A / <i>Analysis Of Alternatives</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	7.307	9.753	10.023	-	10.023	10.092	10.225	10.427	10.765	0.000	68.592
EC7: <i>Analysis Of Alternatives</i>	-	7.307	9.753	10.023	-	10.023	10.092	10.225	10.427	10.765	0.000	68.592

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 Program Element (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 Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and Plans. Work in this Program Element (PE) is performed by analytical agencies such as U.S. Army TRADOC Analysis Center and U.S. Army Materiel Systems Analysis Activity. The Army is projecting to start work on multiple Analyses of Alternatives beginning in FY 2020, 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)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	9.921	9.765	10.023	-	10.023
Current President's Budget	7.307	9.753	10.023	-	10.023
Total Adjustments	-2.614	-0.012	0.000	-	0.000
• Congressional General Reductions	-0.006	-0.012			
• Congressional Directed Reductions	-2.310	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.298	-			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604100A / <i>Analysis Of Alternatives</i>				Project (Number/Name) EC7 / <i>Analysis Of Alternatives</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EC7: <i>Analysis Of Alternatives</i>	-	7.307	9.753	10.023	-	10.023	10.092	10.225	10.427	10.765	0.000	68.592
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 Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and Plans. Work in this Program Element is performed by analytical agencies such as U.S. Army TRADOC Analysis Center and U.S. Army Materiel Systems Analysis Activity. The Army is projecting to start work on multiple Analyses of Alternatives beginning in FY 2020 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 2018	FY 2019	FY 2020
Title: Analysis of Alternatives	7.307	9.396	10.023
Description: This Project provides funding for analytical support for the following efforts:			
FY 2019 Plans: FY 2019 funding supports Analysis of Alternatives for new start programs that do not yet have a Program Manager assigned and to augment PM funds where requirement decisions drive changes in scope or increased fidelity to achieve Congressional intent and interest. Analysis of Alternatives initiation, scope, and fidelity are determined through the AROC process prior to the materiel development decision. Current projections indicate multiple new start programs will need to start their Analysis of Alternatives in FY 2019, including Unified Network Operations, Common Operating Environment, Cyberspace Situational Understanding, Offensive Cyberspace Operations, Mobile Armored Combat Earthmover, and Synthetic Training Environment. In addition, several Analyses of Alternatives started in FY 2018 will continue to require analysis funding into FY 2019, to include Vehicle Protection Suite, Terrestrial Layer Intelligence Support for Multi-Domain Battle/Joint Combined Army Maneuver, Future Tactical Unmanned Aircraft System, and Advanced Threat Detection System. In the Spring of 2018 (on or about 1 May) we will provide the Committee an updated listing of projected FY 2019 new start program Analyses of Alternatives.			
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 Leader's priority intent and interest. The analysis initiation, scope, and fidelity are determined			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604100A / <i>Analysis Of Alternatives</i>	Project (Number/Name) EC7 / <i>Analysis Of Alternatives</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
in accordance with the Joint and Army Requirement Oversight Councils (JROC and AROC) processes prior to the Materiel Development Decision.			
FY 2019 to FY 2020 Increase/Decrease Statement: Minor economic adjustments.			
Title: FY 2019 SBIR / STTR Transfer	-	0.357	-
Description: FY 2019 SBIR / STTR Transfer			
FY 2019 Plans: FY 2019 SBIR / STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	7.307	9.753	10.023

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604100A / <i>Analysis Of Alternatives</i>	Project (Number/Name) EC7 / <i>Analysis Of Alternatives</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Identify Candidates for FY18 AoA funding	██████████																											
Issue FY18 AoA Funding	██████████																											
Identify Candidates for FY19 AoA funding									██████████																			
Issue FY19 AoA Funding													██████████															
Identify Candidates for FY20 AoA funding													██████████															
Issue FY 20 AoA Funding																	██████████											
Identify Candidates for FY21 AoA funding																					██████████							
Issue FY 21 AoA Funding																					██████████							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604100A / <i>Analysis Of Alternatives</i>	Project (Number/Name) EC7 / <i>Analysis Of Alternatives</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Identify Candidates for FY18 AoA funding	4	2017	3	2018
Issue FY18 AoA Funding	1	2018	4	2018
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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	12.393	40.745	-	40.745	20.122	25.281	25.960	28.299	Continuing	Continuing
EX8: <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	-	0.000	12.393	40.745	-	40.745	20.122	25.281	25.960	28.299	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) battle 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 Joint Requirements Oversight Council (JROC) approved the FUAS Initial Capabilities Document (ICD) on 12 OCT 2018. The ICD includes requirements for Scalable Control Interface (SCI), Air Launched Effects (ALE), and Purpose-Driven UAS (to include Future Tactical UAS and Advanced UAS).

The Future Unmanned Aircraft System (FUAS) will be comprised of multiple components including the Future Tactical UAS (FTUAS) for the Brigade Combat Team (BCT), the Advanced UAS (AUAS) for the Combat Aviation Brigades (CAB), and Air Launched Effects (ALE). The FTUAS seeks to replace the RQ-7 assets within the Brigade Combat Teams. Key attributes of the FTUAS 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, and programmatic support. FUAS will penetrate defense-in-depth environments by employing Air Launched Effects (ALE) with teaming and swarming effects to detect, decoy, jam RADAR and communications, conduct cyber-attack, spoof and jam GPS, and kinetic engagement.

Justification: FY 2020 FTUAS RDTE Base funding of \$40.745 million (M) will be utilized for the following: 1) \$18.079M to support the USARPAC Multi-Domain Task Force (MDTF) Demonstration, 2) \$20.000M to support ALE Early Systems Analysis, 3) \$2.666M provides Systems Engineering and Program Management (SEPM) to support of FTUAS and ALE development and preparation of pre-milestone decision documentation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	12.393	5.645	-	5.645
Current President's Budget	0.000	12.393	40.745	-	40.745
Total Adjustments	0.000	0.000	35.100	-	35.100
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	35.100	-	35.100

Change Summary Explanation

Increase of \$35.100 million in FY2020 will provide required support for the Multi-Domain Task Force (MDTF) demonstration and ALE Early Systems Analysis.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>				Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EX8: <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	-	0.000	12.393	40.745	-	40.745	20.122	25.281	25.960	28.299	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) battle 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 FUAS Initial Capabilities Document (ICD) was approved by the Joint Requirements Oversight Council (JROC) on 12 OCT 2018. The ICD includes requirements for Scalable Control Interface (SCI), Air Launched Effects (ALE), and Purpose-Driven UAS (to include Future Tactical UAS and Advanced UAS).

The Future Unmanned Aircraft System (FUAS) will be comprised of multiple components including the Future Tactical UAS (FTUAS) for the Brigade Combat Team (BCT), the Advanced UAS (AUAS) for the Combat Aviation Brigades (CAB), and Air Launched Effects (ALE). The FTUAS seeks to replace the RQ-7 assets within the Brigade Combat Teams. Key attributes of the FTUAS 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, and programmatic support. FUAS will penetrate defense-in-depth environments by employing Air Launched Effects (ALE) with teaming and swarming effects to detect, decoy, jam RADAR and communications, conduct cyber-attack, spoof and jam GPS, and kinetic engagement.

Justification: FY 2020 FTUAS Base funding of \$40.745 million (M) will be utilized for the following: 1) \$18.079M to support the USARPAC Multi-Domain Task Force (MDTF) Demonstration, 2) \$20.000M to support ALE Early Systems Analysis, 3) \$2.666M provides Systems Engineering and Program Management (SEPM) to support of FTUAS and ALE development and preparation of pre-milestone decision documentation.

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

	FY 2018	FY 2019	FY 2020
Title: Multi Domain Task Force (MDTF) Demonstration	-	10.800	18.079
Description: Funding for USARPAC Multi-Domain Task Force (MDTF) Demonstration supports UAS aircraft, payload and Multi-Function Electronic Warfare (MFEW) demonstration which will inform FTUAS requirements and Analysis of Alternatives (AoA).			
FY 2019 Plans: Funding for USARPAC Multi-Domain Task Force (MDTF) Experimentation supports UAS aircraft, payload and Multi-Function Electronic Warfare (MFEW) experimentation which will inform FTUAS requirements and Analysis of Alternatives (AoA).			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Funding for USARPAC Multi-Domain Task Force (MDTF) Demonstration supports UAS aircraft, payload and Multi-Function Electronic Warfare (MFEW) demonstration which will inform FTUAS requirements and Analysis of Alternatives (AoA). FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$15.100 million in FY2020 will provide required support for the MDTF demonstration.				
Title: Air Launched Effects (ALE) Early Systems Analysis Description: ALE Early Systems Analysis in preparation for a Materiel Development Decision (MDD), and to inform requirements and an Analysis of Alternatives (AoA). The PM will conduct market research, early 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: Funds ALE market research, early systems engineering analyses and assessment of proposed candidate materiel solution approaches. FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$20M in FY2020 funds ALE market research, early systems engineering analyses and assessment of proposed candidate materiel solution approaches.		-	-	20.000
Title: System Engineering/Program Management Description: System Engineering and Program Management (SEPM) FY 2019 Plans: Funding for System Engineering/Program Management (SEPM) to support FTUAS pre-milestone decision requirements such as: MDTF Experimentation, market research, Validated On-line Threat (VOLT) Assessment, Analysis of Alternatives (AoA), independent cost estimates and other required milestone documents. FY 2020 Plans: Funding for SEPM to support FTUAS pre-milestone decision requirements such as: Analysis of Alternatives (AoA), independent cost estimates and other required milestone documents FY 2019 to FY 2020 Increase/Decrease Statement: Program increasing funds due to upcoming MDD in FY2021.		-	1.593	2.666
Accomplishments/Planned Programs Subtotals		-	12.393	40.745

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• A01310: <i>Tactical Unmanned Aircraft System (TUAS)</i>	-	-	12.100	-	12.100	1.101	25.345	38.100	55.400	0.000	132.046

Remarks

FY 2020 base procurement dollars in the amount of \$12.1 million supports the FVL CFT FTUAS demonstration: Specifically, the procurement of 12 attrition air vehicles, New Equipment Training (NET) and PM support.

D. Acquisition Strategy

TRADOC Capabilities Manager (TCM) - Future Vertical Lift (FVL) has prepared an Initial Capabilities Document (ICD) that is in JROC staffing. PM TUAS will follow that approval with an MDD in FY 2021 and a subsequent Analysis of Alternatives phase.

The Future Vertical Lift (FVL) Cross Functional Team (CFT) is overseeing a demonstration effort in FY 2019 and FY 2020 that will inform the Future Tactical Unmanned Aircraft System (FTUAS) requirement to develop capability that will ultimately replace the RQ-7B (Shadow Tactical Unmanned Aircraft System) within the Brigade Combat Team (BCT) formation. Demonstration effort will focus on conducting analysis and obtaining field data that will be used to write the Capabilities Development Document that will serve as the formal requirement to replace the RQ-7B within the BCTs. As part of the program development, a Materiel Development Decision will be conducted in FY2021 followed by an Analysis of Alternatives and ultimately a decision that will identify the appropriate entry into the Milestone Decision process.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Systems Engineering and Program Management (SEPM)	C/TBD	PM TUAS : Redstone Arsenal	-	-		1.593		2.666		-		2.666	Continuing	Continuing	-
Subtotal			-	-		1.593		2.666		-		2.666	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Air Launched Effects (ALE) Early Systems Analysis	TBD	PM TUAS : Redstone Arsenal	-	-		-		20.000		-		20.000	0.000	20.000	-
Subtotal			-	-		-		20.000		-		20.000	0.000	20.000	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Multi Domain Task Force (MDTF) UAS Demonstration	SS/ Various	Various : Various	-	-		10.800		18.079		-		18.079	12.821	41.700	-
Subtotal			-	-		10.800		18.079		-		18.079	12.821	41.700	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	12.393	40.745	-	40.745	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Multi Domain Task Force Demonstration (MDTF)																																
System Engineering/Program Management (SEPM)																																
FTUAS Demonstration (APA Funded)																																
Analysis of Alternatives (AoA)																																
Materiel Development Decision (MDD)																																
Milestone C																																
LRIP (APA Funded)																																
IOTE																																
FRP Decision																																
FRP (APA Funded)																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604113A / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>	Project (Number/Name) EX8 / <i>Future Tactical Unmanned Aircraft System (FTUAS)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Multi Domain Task Force Demonstration (MDTF)	1	2019	4	2021
System Engineering/Program Management (SEPM)	1	2019	4	2024
FTUAS Demonstration (APA Funded)	2	2020	1	2021
Analysis of Alternatives (AoA)	4	2020	1	2021
Materiel Development Decision (MDD)	1	2021	1	2021
Milestone C	1	2022	1	2022
LRIP (APA Funded)	2	2022	4	2023
IOTE	1	2023	2	2023
FRP Decision	4	2023	4	2023
FRP (APA Funded)	1	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	57.437	89.248	427.772	-	427.772	376.738	332.322	241.461	87.500	Continuing	Continuing
EX2: Lower Tier Air Missile Defense (LTAMD) Capability	-	57.437	89.248	427.772	-	427.772	376.738	332.322	241.461	87.500	Continuing	Continuing

Note

LTAMDS is currently scheduled to begin receiving procurement funds in FY 2022.

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 will competitively select the sensor/radar set (RS) to replace the baseline PATRIOT RS (AN/MPQ-65A) due to threat changes and the growing obsolescence and high Operational & Support (O&S) cost of the existing RS. The LTAMDS capability will address critical capability gaps, modernize technology, reduce O&S costs, mitigate obsolescence, and increase reliability and maintainability. The LTAMDS capability will increase sensor/radar performance to maximize the inherent PAC-3 Missile Segment Enhanced (MSE) Interceptor capabilities to engage threats.

FY 2020 base dollars in the amount of \$427.772 million supports acceleration of the Lower Tier Air Missile Defense (LTAMDS) Sensor program. FY 2020 tasks include purchase of prototypes, purchase of test equipment, and supports programmatic and engineering activities needed to select the best technical approach that meets accelerated fielding timelines and facilitates incremental capability enhancements.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	76.728	120.374	125.772	-	125.772
Current President's Budget	57.437	89.248	427.772	-	427.772
Total Adjustments	-19.291	-31.126	302.000	-	302.000
• Congressional General Reductions	-0.049	-0.111			
• Congressional Directed Reductions	-16.900	-31.015			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.342	-			
• Adjustments to Budget Years	-	-	302.000	-	302.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604114A / <i>Lower Tier Air Missile Defense (LTAMD) Sensor</i>	
Change Summary Explanation FY 2020 funding increase of \$302.000 million to accelerate program's IOC to select the best technical approach that meets accelerated fielding timelines and facilitates incremental capability enhancements in accordance with FY 2018 NDAA requirement to accelerate LTAMDS Initial Operational Capability to not later than December 2023. FY 2019 funding reduction of \$31.126 million. FY 2018 funding reduction of \$16.900 million for contract award delay, Congressional rescission \$0.049 million, and \$2.342 million for SBIR/STTR transfer.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EX2: Lower Tier Air Missile Defense (LTAMD) Capability	-	57.437	89.248	427.772	-	427.772	376.738	332.322	241.461	87.500	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in FY 2017, funding realigned from PE 0607865A, PATRIOT Product Improvement (Project DV8).

CFT Supported, LTAMDS.

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. The Army Requirements Oversight Council (AROC) approved LTAMDS requirements in April 2016.

The Army will competitively select the LTAMDS to service Air and Missile Defense threats using state of the art technology, reduce Operating and Sustainment, mitigate obsolescence, and increase reliability and maintainability.

LTAMDS FY 2020 funding will be utilized for procurement of prototypes, integration of LTAMDS technology into prototypes, further development of system performance specifications, and to initiate contractor verification testing. FY 2020 activities support the FY 2018 NDAA requirement to accelerate LTAMDS Initial Operational Capability to not later than December 2023.

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

	FY 2018	FY 2019	FY 2020
Title: Lower Tier Missile Defense Sensor	57.388	84.981	427.772
Description: 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.			
FY 2019 Plans:			
- Coordinate competitive LTAMDS Sense-Off demonstration			
- Conduct LTAMDS Sense-Off demonstration			
- Select single vendor to integrate LTAMDS solution			
- Execute System Requirements Review with selected vendor			
- Award OTA agreement to build and integrate LTAMDS solution for Initial Operational Capability / Urgent Material Release			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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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
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
- Identify and purchase long-lead items			
FY 2020 Plans: - Initiate LTAMDS prototype manufacture and integration activities - Conduct knowledge point and functional reviews of vendor prototypes - Initiate Contractor Verification Testing			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 funding increase of \$342.791 million funds activities to achieve FY2018 NDAA requirement to accelerate LTAMDS Initial Operational Capability to not later than December 2023.			
Title: FY18 Congressional Rescission	0.049	-	-
Title: FY 2019 SBIR/STTR TRANSFER	-	4.267	-
Description: FY 2019 SBIR/STTR TRANSFER			
FY 2019 Plans: FY 2019 SBIR/STTR TRANSFER			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR TRANSFER			
Accomplishments/Planned Programs Subtotals	57.437	89.248	427.772

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• DV8: Patriot Product Improvement	77.391	75.288	96.430	-	96.430	102.095	81.545	97.510	96.395	0.000	626.654
• C12101: Lower Tier Air and Missile Defense Sensor	-	-	0.000	-	0.000	-	36.000	66.300	195.000	Continuing	Continuing

Remarks

D. Acquisition Strategy
To enhance the Warfighter's lethality, survivability, and combat effectiveness, the Army is using 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 will be leveraged in conjunction with the OTA to facilitate and accelerate the LTAMDS program. OTA promotes non-traditional defense contractor involvement, cost sharing arrangements, and accelerates schedules. A FEDBIZOPS announcement and subsequent LTAMDS

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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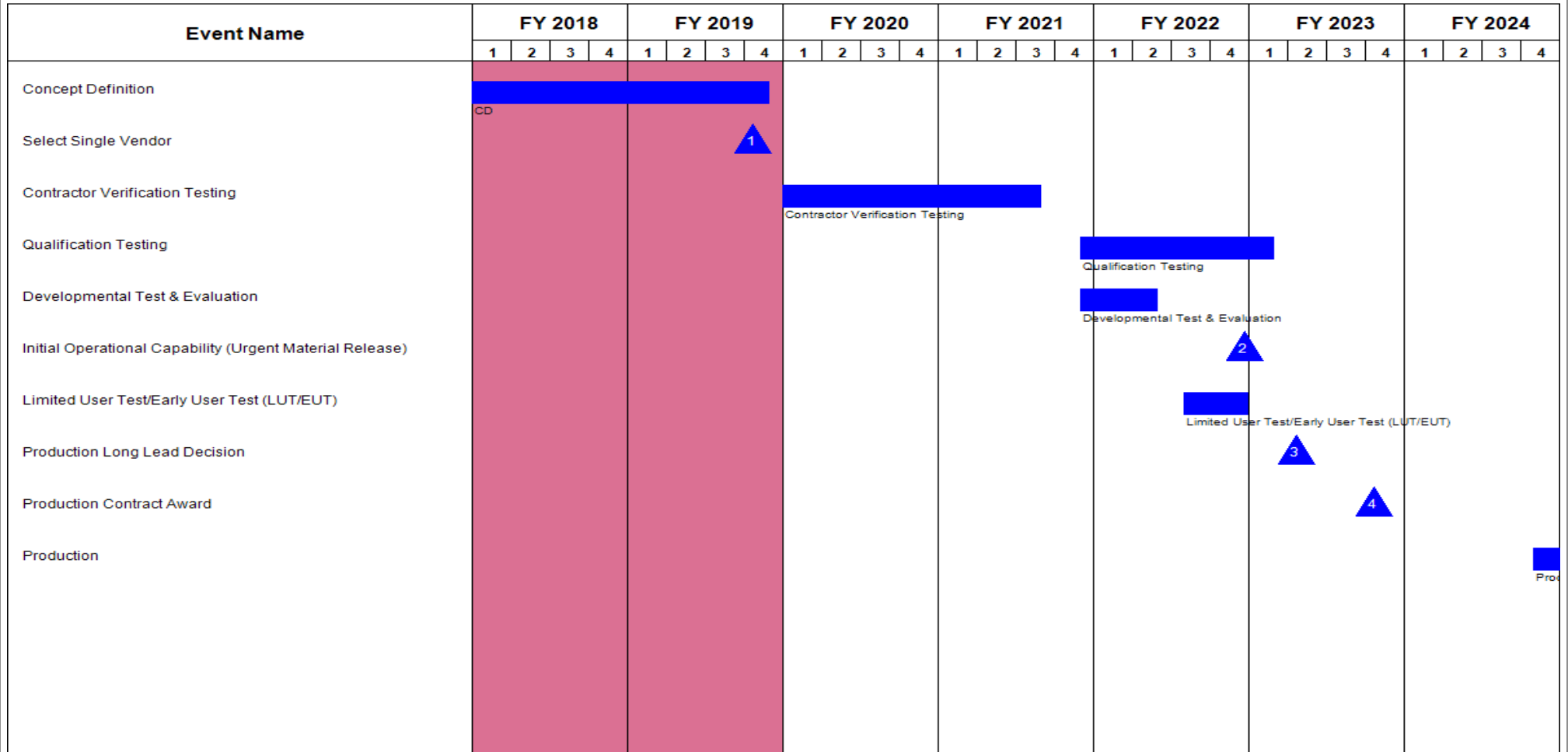
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Program Management	MIPR	Various : Redstone Arsenal, AL	6.285	3.515	Oct 2017	4.515	Oct 2018	2.350	Oct 2019	-		2.350	Continuing	Continuing	-
Systems Engineering and Technical Assistance (SETA)	Various	Systems Engineering and Technical Assistance : Huntsville, AL	3.000	5.000	Oct 2017	5.000	Oct 2018	6.000	Oct 2019	-		6.000	Continuing	Continuing	-
Subtotal			9.285	8.515		9.515		8.350		-		8.350	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Concept Definition	C/CPFF	Raytheon, Lockheed Martin, Technovative Applications, Northrop Grumman : Andover MA; Liverpool NY; Brea CA; Linthicum MD	24.495	40.322	Mar 2018	10.000	Jan 2019	-		-		-	Continuing	Continuing	-
Product Development Support	C/TBD	TBD : TBD	-	-		3.000	Oct 2018	4.000	Oct 2019	-		4.000	Continuing	Continuing	-
Rapid Prototyping	TBD	TBD : TBD	-	-		51.366	Sep 2019	369.172	Jan 2020	-		369.172	Continuing	Continuing	-
SBIR/STTR	TBD	TBD : TBD	-	-		4.267		-		-		-	0.000	4.267	-
Subtotal			24.495	40.322		68.633		373.172		-		373.172	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	TBD	TBD : TBD	-	-		-		2.250		-		2.250	Continuing	Continuing	-
Subtotal			-	-		-		2.250		-		2.250	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
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

Events	Start		End	
	Quarter	Year	Quarter	Year
Concept Definition	4	2017	4	2019
Select Single Vendor	4	2019	4	2019
Contractor Verification Testing	1	2020	3	2021
Qualification Testing	4	2021	1	2023
Developmental Test & Evaluation	4	2021	2	2022
Initial Operational Capability (Urgent Material Release)	4	2022	4	2022
Limited User Test/Early User Test (LUT/EUT)	3	2022	4	2022
Production Long Lead Decision	2	2023	2	2023
Production Contract Award	4	2023	4	2023
Production	4	2024	4	2027

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	145.618	95.229	196.676	-	196.676	156.986	272.762	314.992	254.062	0.000	1,436.325
AX3: Technology Maturation Initiatives*	-	0.000	0.000	0.000	-	0.000	10.000	138.244	296.992	250.456	0.000	695.692
AX4: Computational Prototyping Environment (CPE)	-	0.000	0.000	3.966	-	3.966	5.426	6.918	0.000	0.000	0.000	16.310
AX5: Next Generation Close Combat Missile	-	0.000	0.000	9.000	-	9.000	5.000	0.000	0.000	0.000	0.000	14.000
AX6: Active Protection Systems Integration	-	0.000	0.000	9.400	-	9.400	10.500	0.000	0.000	0.000	0.000	19.900
AX7: Multi-Mission High Energy Laser (MMHEL) Sys Demo	-	0.000	0.000	18.650	-	18.650	8.150	0.000	0.000	0.000	0.000	26.800
AX8: Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)	-	0.000	0.000	27.200	-	27.200	4.000	0.000	0.000	0.000	0.000	31.200
AX9: Adv Mobility Experimental Prototype Adv Tech	-	0.000	0.000	10.500	-	10.500	15.800	10.500	7.200	3.606	0.000	47.606
AY1: MUM-T Platform Enabler	-	0.000	0.000	7.200	-	7.200	4.500	4.200	0.000	0.000	0.000	15.900
AY2: Army Operational Fires	-	0.000	0.000	18.900	-	18.900	28.400	41.900	10.800	0.000	0.000	100.000
AY3: Strategic Long Range Cannon	-	0.000	0.000	91.860	-	91.860	65.210	71.000	0.000	0.000	0.000	228.070
DS3: Technology Maturation Initiatives	-	145.618	95.229	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	240.847

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2020

Note

The following Projects within this Program Element (PE) are new starts:

- * AX8 (Adv Leth and Accuracy Sys for Med Calber)
- * AX9 (Adv Mobility Experimental Prototype Adv Tech)
- * AY1 (MUM-T Platform Enabler)
- * AY2 (Army Operational Fires)
- * AY3 (Strategic Long Range Cannon)

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>
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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 Army experimentation efforts and programs of record. Computational Prototyping Environment (CPE) efforts include demonstration of physics-based, computational modeling integrated with new advances in deep learning to explore design tradespaces and understand defeat strategies for prototype platforms. 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 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	115.221	95.347	99.584	-	99.584
Current President's Budget	145.618	95.229	196.676	-	196.676
Total Adjustments	30.397	-0.118	97.092	-	97.092
• Congressional General Reductions	-0.093	-0.118			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	35.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.510	-			
• Adjustments to Budget Years	-	-	97.092	-	97.092

Change Summary Explanation

FY 2018 Congressional Add to Project DS3, Technology Maturation Initiatives for Multi-Mission High-Energy Laser Research (\$35.000 million).
 FY 2020 increase due to new starts for Projects AX8, AX9, AY1, AY2, and AY3 to support Army Modernization Priorities.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX4 / <i>Computational Prototyping Environment (CPE)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX4: <i>Computational Prototyping Environment (CPE)</i>	-	0.000	0.000	3.966	-	3.966	5.426	6.918	0.000	0.000	0.000	16.310
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019 this effort was funded in 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 FY 2020 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 2018	FY 2019	FY 2020
Title: Computational Prototyping Environment (CPE)	-	-	3.966
Description: Computational Prototyping Environment (CPE) matures and integrates physics-based, computational modeling with new advances in deep learning in order to demonstrate a robust Virtual Proving Ground (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. CPE capabilities will be piloted to support and inform Army Future Vertical Lift platform designs.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX4 / <i>Computational Prototyping Environment (CPE)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> In FY 2019, funding for this effort resides in PE/Proj 0604115A/DS3. Funding has been realigned in FY 2020 to reflect the FY 2020 financial restructure and Army Modernization Priorities.</p>				
Accomplishments/Planned Programs Subtotals		-	-	3.966
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				
E. Performance Metrics				
N/A				

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX4 / <i>Computational Prototyping Environment (CPE)</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Computational Prototyping Environment	[Redacted]																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX4 / <i>Computational Prototyping Environment (CPE)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Computational Prototyping Environment	3	2018	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX5 / <i>Next Generation Close Combat Missile</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX5: <i>Next Generation Close Combat Missile</i>	-	0.000	0.000	9.000	-	9.000	5.000	0.000	0.000	0.000	0.000	14.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was previously funded in 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 FY 2021 to mature technology and demonstrate needed Warfighter capability in advance of acquisition program of record.

Work in this PE complements PE 0603462A, Next Generation Close Combat Vehicle Advanced Technology.

Funding has been realigned to reflect the FY 2020 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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
Title: Next Generation Close Combat Missile	-	-	9.000
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 testing to verify predicted aerodynamic and control surface performance. Will exercise subsystem performance models in an integrated flight simulation and mature flight software.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX5 / <i>Next Generation Close Combat Missile</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
In FY 2019, funding for this effort resides in PE/Proj 0604115A/DS3.			
Accomplishments/Planned Programs Subtotals	-	-	9.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>		Project (Number/Name) AX5 / <i>Next Generation Close Combat Missile</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Next Generation Close Combat Missile																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX5 / <i>Next Generation Close Combat Missile</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Next Generation Close Combat Missile	1	2019	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX6 / <i>Active Protection Systems Integration</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX6: <i>Active Protection Systems Integration</i>	-	0.000	0.000	9.400	-	9.400	10.500	0.000	0.000	0.000	0.000	19.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was funded in 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 fleet of 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 will 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 FY 2020 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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
Title: Agile Layered Protection: APS Integration Advanced Technology Demonstrator	-	-	9.400
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 for survivability and protection through advanced threat detection, multiple threat defeat systems, and improved situational awareness. Work is coordinated with PE 0602622A, 0603004A, 0602705A, 0602712A, 0603710A, 0602601A, 0603270A, 0603313A, 0603005A, 0603462A.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX6 / <i>Active Protection Systems Integration</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p><i>FY 2020 Plans:</i> 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. Will design and begin integration of additional layered protection technologies.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> In FY 2019, funding for this effort resides in PE/Project 0604115A/DS3.</p>			
Accomplishments/Planned Programs Subtotals	-	-	9.400

<p>C. Other Program Funding Summary (\$ in Millions) N/A</p> <p>Remarks</p> <p>D. Acquisition Strategy N/A</p> <p>E. Performance Metrics N/A</p>
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX6 / <i>Active Protection Systems Integration</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Integration of APS Layered Protection Technologies (0604115A)	DS3 in FY 2019)				[Bar]																							
Validation of Integrated Layered Protection Technologies									[Bar]																			
Integration of Added APS Layered Protection Technologies									[Bar]																			
Validation of Added APS Layered Protection Technologies													[Bar]															

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX6 / <i>Active Protection Systems Integration</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
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	3	2020	3	2021
Validation of Added APS Layered Protection Technologies	3	2021	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX7 / <i>Multi-Mission High Energy Laser (MMHEL) Sys Demo</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>AX7: Multi-Mission High Energy Laser (MMHEL) Sys Demo</i>	-	0.000	0.000	18.650	-	18.650	8.150	0.000	0.000	0.000	0.000	26.800
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was funded in 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.

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 (SMDC/ARSTRAT).

Funding has been realigned to reflect the FY 2020 financial restructure and to support Army Modernization Priorities in support of the National Defense Strategy.

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

	FY 2018	FY 2019	FY 2020
Title: Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	-	-	18.650
Description: This effort matures, integrates and demonstrates HEL technologies on Army Stryker 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 UAS threats. Knowledge gained from demonstration will be transitioned to PEO Missiles and Space to inform the future objective M-SHORAD Program of Record following the FY21 demonstration.			
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,			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX7 / <i>Multi-Mission High Energy Laser (MMHEL) Sys Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
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 2019 to FY 2020 Increase/Decrease Statement: This effort is realigned from PE/Project 0604115A/DS3 in FY 2020.				
Accomplishments/Planned Programs Subtotals		-	-	18.650
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				
E. Performance Metrics N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)						
2040 / 4					PE 0604115A / Technology Maturation Initiatives				AX7 / Multi-Mission High Energy Laser (MMHEL) Sys Demo						
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	C/Various	SMDTC : Huntsville, AL	-	-		-		18.650		-		18.650	8.150	26.800	-
Subtotal			-	-		-		18.650		-		18.650	8.150	26.800	N/A
Project Cost Totals			-	-		0.000		18.650		-		18.650	8.150	26.800	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX7 / <i>Multi-Mission High Energy Laser (MMHEL) Sys Demo</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Multi-Mission High Energy Laser (MMHEL) – System-Level Design (PE 0604115A)																												
MMHEL – Subsystem Design Refinement, Assembly, and Delivery (PE 0604115A)																												
MMHEL – Firing Doctrine and Experimental Prototype System Software (PE 0604115A)																												
MMHEL – Experimental Prototype System Integration and Checkout (PE 0604115A, Pro)																												
MMEHL – Experimental Prototype System Demonstration and Assess																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX7 / <i>Multi-Mission High Energy Laser (MMHEL) Sys Demo</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX8 / <i>Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX8: <i>Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>	-	0.000	0.000	27.200	-	27.200	4.000	0.000	0.000	0.000	0.000	31.200
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in FY 2020.

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, Project BF5, Advanced Lethality and Accuracy System for Med Cal; and PE 0603462A, Project BG1, Sensors for Autonomous Operations and Survivability 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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
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 Advanced Lethality and Accuracy System for Medium Caliber (ALAS-MC) advanced technology development effort into vehicle-agnostic combat turret to inform requirements for the Next Generation Combat Vehicle.			
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 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX8 / <i>Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
This effort is a new start in FY 2020.			
<p>Title: Advanced Targeting and Lethality Automated System (ATLAS)</p> <p>Description: The Advanced Targeting and Lethality Automated System (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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020.</p>	-	-	22.200
Accomplishments/Planned Programs Subtotals	-	-	27.200

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) <i>AX8 I Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ALAS-MC: Procure Ammo Rounds H/W	C/Variou	ARDEC : Picatinny, NJ	-	-		-		3.700		-		3.700	0.000	3.700	-
ALAS-MC: Control Unit	C/Variou	ARDEC : Picatinny, NJ	-	-		-		0.300		-		0.300	0.000	0.300	-
ALAS-MC: Test Hardware	TBD	ARDEC : Picatinny, NJ	-	-		-		0.200		-		0.200	0.000	0.200	-
ATLAS: System Design	TBD	CERDEC : Fort Belvoir, VA	-	-		-		5.000		-		5.000	0.000	5.000	-
ATLAS: Artificial Intelligence/Machine Learning Development	TBD	CERDEC : Fort Belvoir, VA	-	-		-		6.500		-		6.500	0.000	6.500	-
ATLAS: Data Collection and Synthetic Data	TBD	CERDEC : Fort Belvoir, VA	-	-		-		9.300		-		9.300	0.000	9.300	-
ATLAS: Integration and Test	TBD	CERDEC : Fort Belvoir, VA	-	-		-		1.400		-		1.400	0.000	1.400	-
Subtotal			-	-		-		26.400		-		26.400	0.000	26.400	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ALAS-MC	TBD	ARDEC : Picatinny, NJ	-	-		-		0.800		-		0.800	0.000	0.800	-
Subtotal			-	-		-		0.800		-		0.800	0.000	0.800	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	27.200	-	27.200	0.000	27.200	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX8 / <i>Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
ALAS-MC: Procure Ammo Rounds H/W									■																			
ALAS-MC: Control Unit													■															
ALAS-MC: Test Hardware													■															
ATLAS: System Design																	■											
ATLAS: AIML Development																	■											
ATLAS: Data Collection and Synthetic Data																	■											
ATLAS: Integration and Test																	■											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX8 / <i>Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
ALAS-MC: Procure Ammo Rounds H/W	2	2020	1	2022
ALAS-MC: Control Unit	3	2020	1	2022
ALAS-MC: Test Hardware	3	2020	1	2022
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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AX9 / <i>Adv Mobility Experimental Prototype Adv Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
<i>AX9: Adv Mobility Experimental Prototype Adv Tech</i>	-	0.000	0.000	10.500	-	10.500	15.800	10.500	7.200	3.606	0.000	47.606
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in Fiscal Year (FY) 2020.

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/Project 0603462A/BG4 (Advanced Mobility Experimental Prototype (AMEP)).

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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
Title: Advanced Mobility Experimental Prototype	-	-	10.500
Description: Efforts integrate and demonstrate advanced powertrain, power generation, and running gear 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 is coordinated with efforts in PE/Project 0603462A/BG4.			
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 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX9 / <i>Adv Mobility Experimental Prototype Adv Tech</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
This effort is a new start in FY 2020 and was not funded in FY 2019.			
Accomplishments/Planned Programs Subtotals	-	-	10.500

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX9 / <i>Adv Mobility Experimental Prototype Adv Tech</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Initial Integration Design of Components									■																			
Fabricate Powertrain Technologies													■															
Fabricate Advanced Running Gear													■															
Perform Design Integration for Surrogate Vehicle Platform																	■											
Vehicle Test Plan Development & Final Integration																					■							
Develop air handling, cooling system, final drives & controls testing																	■				■							
Initial Test & Evaluation																									■			
Data Analysis																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AX9 / <i>Adv Mobility Experimental Prototype Adv Tech</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Initial Integration Design of Components	1	2020	4	2020
Fabricate Powertrain Technologies	1	2020	3	2021
Fabricate Advanced Running Gear	1	2020	3	2021
Perform Design Integration for Surrogate Vehicle Platform	4	2020	4	2021
Vehicle Test Plan Development & Final Integration	1	2022	4	2022
Develop air handling, cooling system, final drives & controls testing	3	2020	4	2022
Initial Test & Evaluation	1	2023	2	2023
Data Analysis	3	2023	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY1 / <i>MUM-T Platform Enabler</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY1: <i>MUM-T Platform Enabler</i>	-	0.000	0.000	7.200	-	7.200	4.500	4.200	0.000	0.000	0.000	15.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in Fiscal Year (FY) 2020.

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.

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 U.S. Army Futures Command.

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

	FY 2018	FY 2019	FY 2020
Title: Unmanned Aerial Vehicle (UAV) / Ground Platform Integration	-	-	4.050
Description: This effort matures and demonstrates in an operational environment technologies that address critical capability challenges related to the integration of Unmanned Aerial Vehicles (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 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020			
Title: Transportable Manned Unmanned Teaming (MUMT) Simulation	-	-	3.150

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY1 / <i>MUM-T Platform Enabler</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: This effort provides an immersive, transportable Manned Unmanned Teaming (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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020.</p>				
Accomplishments/Planned Programs Subtotals		-	-	7.200
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				
E. Performance Metrics				
N/A				

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY1 / <i>MUM-T Platform Enabler</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
UAV/Ground Platform Integration																												
Transportable Simulator																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY1 / <i>MUM-T Platform Enabler</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
UAV/Ground Platform Integration	1	2020	4	2022
Transportable Simulator	2	2020	3	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY2 / <i>Army Operational Fires</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY2: <i>Army Operational Fires</i>	-	0.000	0.000	18.900	-	18.900	28.400	41.900	10.800	0.000	0.000	100.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in Fiscal Year (FY) 2020.

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 0603464 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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
Title: Army Operational Fires	-	-	18.900
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 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020			
Accomplishments/Planned Programs Subtotals	-	-	18.900

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY2 / <i>Army Operational Fires</i>

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>		Project (Number/Name) AY2 / <i>Army Operational Fires</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Army Operational Fires																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY2 / <i>Army Operational Fires</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Army Operational Fires	1	2020	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) AY3 / <i>Strategic Long Range Cannon</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY3: <i>Strategic Long Range Cannon</i>	-	0.000	0.000	91.860	-	91.860	65.210	71.000	0.000	0.000	0.000	228.070
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in Fiscal Year (FY) 2020.

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 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. This Project also demonstrates and experiments with emerging and commercially-available technology components to demonstrate improved Stinger capabilities when used in a Man Portable Air Defense System (MANPADS) configuration.

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 U.S. Army Futures Command (AFC).

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

	FY 2018	FY 2019	FY 2020
Title: Strategic Long Range Cannon	-	-	64.860
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/AE6 (Strategic Long Range Cannon Advanced Technology). Will integrate test hardware and conduct subsystem testing and experimentation.			
FY 2019 to FY 2020 Increase/Decrease Statement: This effort is a new start in FY 2020			
Title: Extended Range Cannon Artillery (ERCA) Autoloader	-	-	11.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY3 / <i>Strategic Long Range Cannon</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2020 Plans: Will mature and integrate ammunition handling automation technologies into a sub-system prototype for demonstration and validation of performance.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This is an FY 2020 new start effort</p>				
<p>Title: Extended Range Cannon Artillery (ERCA) Projectile</p> <p>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.</p> <p>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 GPS-denied environments.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This is an FY 2020 new start effort</p>		-	-	4.000
<p>Title: Dismounted Man-Portable Air Defense System (MANPADS) Experiment</p> <p>Description: This effort demonstrates and experiments with potential government and/or industry technology components to improve the effective range of the Stinger missile in the man-portable air defense system (MANPADS) configuration. The goal of this effort is to demonstrate improved Stinger capabilities when used in a MANPADS configuration.</p> <p>FY 2020 Plans: Will select technology components from government and/or industry sources and conduct system demonstrations and experimentation in realistic and representative operational environment(s). Will conduct experimentation efforts using various system component options to demonstrate improved effective range of the Stinger missile when configured for man-portable air</p>		-	-	12.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY3 / <i>Strategic Long Range Cannon</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
defense (MANPADS). Experimentation results will inform requirements and systems planning for future Mobile Short-Range Air Defense (M-SHORAD) capabilities. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> This is an FY 2020 new start effort			
Accomplishments/Planned Programs Subtotals	-	-	91.860

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604115A / Technology Maturation Initiatives				AY3 / Strategic Long Range Cannon							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Strategic Long Range Cannon	C/Variou	ARDEC : Picatinny, NJ	-	-		-		64.860		-		64.860	136.210	201.070	-
Extended Range Cannon Artillery (ERCA) Autoloader	C/Variou	ARDEC : Picatinny, NJ	-	-		-		11.000		-		11.000	0.000	11.000	-
Extended Range Cannon Artillery (ERCA) Projectile	C/Variou	ARDEC : Picatinny, NJ	-	-		-		4.000		-		4.000	0.000	4.000	-
Subtotal			-	-		-		79.860		-		79.860	136.210	216.070	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	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 Mlssile Defense System : Huntsville, AL	-	-		-		12.000		-		12.000	0.000	12.000	-
Subtotal			-	-		-		12.000		-		12.000	0.000	12.000	N/A
Project Cost Totals			-	-		0.000		91.860		-		91.860	136.210	228.070	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY3 / <i>Strategic Long Range Cannon</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Strategic Long Range Cannon Hardware Contracting Activities																												
Extended Range Cannon Artillery (ERCA) Autoloader																												
Extended Range Cannon Artillery (ERCA) Projectile																												
Dismounted Man-Portable Air Defense System (MANPADS) Experiment																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) AY3 / <i>Strategic Long Range Cannon</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Strategic Long Range Cannon Hardware Contracting Activities	2	2020	4	2021
Extended Range Cannon Artillery (ERCA) Autoloader	1	2020	4	2020
Extended Range Cannon Artillery (ERCA) Projectile	1	2020	4	2020
Dismounted Man-Portable Air Defense System (MANPADS) Experiment	1	2020	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>				Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
DS3: <i>Technology Maturation Initiatives</i>	-	145.618	95.229	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	240.847
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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>
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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 FY 2020 financial restructure and Army Modernization Priorities.

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

	FY 2018	FY 2019	FY 2020
<p>Title: Vehicle Survivability Subsystem Demonstrator</p> <p>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. This effort is coordinated with efforts in PE 0603005A.</p> <p>FY 2019 Plans: Complete design optimization of the integrated survivability demonstrator to prepare for system level durability and blast testing, achieving survivability systems weight reductions and increasing survivability against advanced and emerging threats. Integrate passive blast technologies and active blast mitigation system countermeasures into a demonstrator for underbody blast and structural evaluation. Conduct durability and blast testing to demonstrate the performance of integrated blast components, including surrogate armor, active blast mitigation, advanced energy absorbing (EA) floors, adjustable EA seats and restraints, and lighter weight hull with same or better levels of protection.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Planned progression of the effort, which concludes in FY 2019.</p>	9.860	7.361	-
<p>Title: Advanced Powertrain Subsystem Demonstrator</p> <p>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 . This effort is coordinated with efforts in PE 0603005A.</p> <p>FY 2019 Plans: Build upon and add components to the major subsystem integration of the multi-cylinder engine and the advanced high efficiency transmission, as part of the overall advanced powertrain demonstrator integration. Verify and validate that all components function as expected. Using a reduced risk strategy, mature and demonstrate high power-density and more fuel efficient integrated</p>	12.433	10.600	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
powertrain to support military tracked vehicles. Optimize system controls to improve performance for a wide range of powertrain applications. The technology is being developed for future military vehicle application such as the Bradley Family of Vehicles and future infantry vehicles. FY 2019 to FY 2020 Increase/Decrease Statement: Planned progression of the effort, which concludes in FY 2019.				
Title: Modular Active Protection System (MAPS) Demonstration Description: This effort conducts Active Protection System (APS) component and subsystem technology maturation and adaption, aligned with Survivability Sets 1, 2, and 3, as well as Expedited APS activity, to increase component reliability, comply with the Army's modular approach to active protection, and resolve component integration challenges. It integrates subsystem technology demonstrators and conducts demonstrations of soft-kill and hard-kill APS capability to verify APS performance within the modular and safe design approach, and to reduce technical risk for APS transition for the current and future combat and tactical vehicle platforms.		8.641	-	-
Title: Active Protection Systems (APS) Integration and Demonstration Description: This effort synchronizes emerging S&T products with the Vehicle Protection Suite (VPS) Program of Record and matures key Active Protection System (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. FY 2019 Plans: Conduct system-level testing of the Modular Active Protection Framework and Controller base-kit. Determine best candidate APS effector and sensor technologies that are MAF-compliant for system-level integration and validation. Begin system-level integration of selected APS effector and sensor technologies on desired combat platform prototypes. FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX6 as part of the financial restructure.		-	7.404	-
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, 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 (TTPs) and Concept of Operations (CONOPS). HEL weapon systems are expected		78.684	54.741	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>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); UAVs; sensors; 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.</p> <p>FY 2019 Plans: Complete design reviews of HEL subsystems (including laser, beam control, power, thermal management, and Army Battle Management Command, Control, and Computers (BMC3) architecture). Begin integration of HEL subsystem hardware and evaluate 50kW-class laser subsystems against performance parameters. Develop initial fire control logic for BMC4I software and define BMC4I interfaces with Army BMC4I network. Develop target laser vulnerability module which provides data on the amount of laser energy required to destroy a given target based upon the location of the laser spot on the target. As complete subsystems are delivered, integrate into a system-level experimental prototype and begin system checkout.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX7 as part of the financial restructure.</p>			
<p>Title: MMHEL Integration and Demonstration (CA)</p> <p>Description: This effort procures equipment/components/subsystems at an accelerated rate compared to the original MMHEL 48 month schedule. This enables completion of the MMHEL Technology Readiness Level 7 demonstration 12 months earlier than original schedule.</p>	35.000	-	-
<p>Title: Next Generation Close Combat Missile</p> <p>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.</p> <p>FY 2019 Plans: Optimize and tailor missile propellant formulation to balance performance versus shock-sensitivity. Conduct a Force Effectiveness Experiment with the Maneuver Center of Excellence/Maneuver Battle Lab. Evaluate preliminary design concepts as a basis for</p>	-	9.424	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
trade studies, development of detailed designs, and NG CCM prototype development and testing. Fabricate wind tunnel models to support further system maturation and testing of NG CCM?s increased range and standoff capabilities. FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX5 as part of the financial restructure.				
Title: Computational Prototyping Environment Description: The Computational Prototyping Environment (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. FY 2019 Plans: Complete initial prototype VPG build. Integrate and validate existing high-fidelity, physics-based models and simulation tools with the prototype VPG to provide an initial proof of concept in support of future VPG development. FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX4 as part of the financial restructure.		1.000	2.219	-
Title: FY 2019 SBIR / STTR Transfer Description: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer		-	3.480	-
Accomplishments/Planned Programs Subtotals		145.618	95.229	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Vehicle Survivability Subsystem Demonstrator	C/Various	Various : Various	11.954	9.860		7.361		-		-		-	0.000	29.175	-
Advanced Powertrain Subsystem Demonstrator	C/Various	Various : Various	14.512	12.433		10.600		-		-		-	0.000	37.545	-
Modular Active Protection Systems (MAPS) Demonstrations	C/Various	Various : Various	21.073	8.641		-		-		-		-	0.000	29.714	-
Active Protection Systems (APS) Integration	C/Various	Various : Various	-	-		7.404		-		-		-	0.000	7.404	-
Multi-Mission High Energy Laser (MMHEL)	C/Various	Various : Huntsville, AL	-	78.684		54.741		-		-		-	0.000	133.425	-
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		2.219		-		-		-	0.000	3.219	-
Next Generation Close Combat Missile	C/Various	Various : Various	-	-		9.424		-		-		-	0.000	9.424	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		3.480		-		-		-	0.000	3.480	-
Subtotal			47.539	145.618		95.229		-		-		-	0.000	288.386	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	47.539	145.618	95.229	-	-	-	0.000	288.386	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Vehicle Survivability Subsystem Demonstrator	█				█																							
Advanced Powertrain Subsystem Demonstrator	█				█																							
Modular Active Protection Systems (MAPS) Demonstrations	█				█																							
Active Protection Systems (APS) Integration	█				█																							
Multi-Mission High Energy Laser (MMHEL) - System-Level Design	█				█																							
MMHEL - Subsystem Design Refinement, Assembly, and Delivery	█				█																							
MMHEL - Firing Doctrine and Experimental Prototype System Software	█				█																							
MMHEL - Experimental Prototype System Integration and Checkout	█				█																							
Next Generation Close Combat Missile	█				█																							
Computational Prototyping Environment	█				█																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / <i>Technology Maturation Initiatives</i>	Project (Number/Name) DS3 / <i>Technology Maturation Initiatives</i>

Schedule Details

Events	Start		End	
	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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604117A / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	Continuing	Continuing
FI4: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	-	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	Continuing	Continuing

A. Mission Description and Budget Item Justification

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) or Capability Production Document (CPD)) that will field the full capability. First, the Army will field the Initial M-SHORAD solution based on a 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, M-SHORAD will transition the Multi-Mission High Energy Laser (MMHEL) from Science and Technology into the M-SHORAD Program of Record. With the increased capability provided by the MMHEL technology, M-SHORAD will provide the long term capability to counter a broader range of FW, RW, UAS, and indirect fires (RAM) threats.

FY 2020 dollars in the amount of \$39.100 million (\$33.100 million base and \$6.000 million OCO) will complete the Initial M-SHORAD capability development and integration into existing maneuver formation equipment. Efforts will include: completion of testing to achieve Urgent Materiel Release and Safety Certification; continuation of the development; and finalization of the required program documentation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604117A / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	20.000	118.085	102.806	-	102.806
Current President's Budget	19.201	79.016	33.100	6.000	39.100
Total Adjustments	-0.799	-39.069	-69.706	6.000	-63.706
• Congressional General Reductions	-0.016	-0.069			
• Congressional Directed Reductions	-	-62.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	23.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.783	-			
• Adjustments to Budget Years	-	-	-69.706	6.000	-63.706

Change Summary Explanation

The FY 2019 decrease of \$39.069 million consists of a \$62.000 million Army Budget Office withhold, an \$23.000 million addition from OCO and a \$0.069 million Congressional reduction.

The FY 2020 decrease of \$69.706 million consists of a \$63.706 million realignment of funding within the Air and Missile Defense portfolio to support Army Modernization in support of the National Defense Strategy and a \$6.000 million realignment to OCO.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604117A / Maneuver - Short Range Air Defense (M-SHORAD)				Project (Number/Name) F14 / Maneuver - Short Range Air Defense (M-SHORAD)			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
F14: Maneuver - Short Range Air Defense (M-SHORAD)	-	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program supports the Cross functional Team (CFT), M-SHORAD.

A. Mission Description and Budget Item Justification

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) or Capability Production Document (CPD)) that will field the full capability. First, the Army will field the Initial M-SHORAD solution based on a 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, M-SHORAD will transition the Multi-Mission High Energy Laser (MMHEL) from Science and Technology into the M-SHORAD Program of Record. With the increased capability provided by the MMHEL technology, M-SHORAD will provide the long term capability to counter a broader range of FW, RW, UAS, and indirect fires (RAM) threats.

FY 2020 dollars in the amount of \$39.100 million (\$33.100 million base and \$6.000 million OCO) will complete the Initial M-SHORAD capability development and integration into existing maneuver formation equipment. Efforts will include: completion of testing to achieve Urgent Materiel Release and Safety Certification; continuation of the development; and finalization of the required program documentation.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Initial M-SHORAD Materiel Development/Integration	19.201	75.711	33.100	6.000	39.100
Description: Develop, test and integrate the Initial M-SHORAD system.					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<ul style="list-style-type: none"> - Complete fabrication of production representative articles - Begin testing to achieve Urgent Materiel Release - Continue the development and finalization of the required program documentation <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Complete testing to achieve Urgent Materiel Release and Safety Certification - Complete required program documentation - Completes final prototypes - Complete Initial M-SHORAD development effort - Transition MMHEL from Science and Technology into the M-SHORAD Program of Record using the Office of the Secretary of Defense (OSD) Manufacturing Technology (ManTech) program <p>FY 2020 OCO Plans:</p> <ul style="list-style-type: none"> - Complete testing to achieve Urgent Materiel Release and Safety Certification - Complete required program documentation - Complete final prototypes - Complete Initial M-SHORAD development effort <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease from FY 2019 to FY 2020 is due to anticipated completion of prototype builds.</p> <p>Title: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>					
Accomplishments/Planned Programs Subtotals	19.201	79.016	33.100	6.000	39.100

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• C14301: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	-	-	0.000	262.100	262.100	537.400	292.200	80.500	78.600	Continuing	Continuing

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks
M-SHORAD procurement is funded through C14301. This includes Initial M-SHORAD procurement (FY 2020 through FY 2022).

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 five Initial M-SHORAD prototypes according to the content of the Directed Requirement. The OTA efforts include: Mission Equipment Package (MEP); Platform Integrator effort to procure the Stryker vehicle and integrate the MEP; and the Stinger Launcher.

In addition, the Program Office will use FY 2021-2024 funds for an M-SHORAD with the MMHEL capability. The Program Office plans to award a single competitive OTA agreement. In FY 2021-2024, the Program will conduct development activities, component qualification, Operational Performance Assessment and Logistics and Safety Certifications. An Urgent Materiel Release and First Unit Equipped are planned for FY 2024.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / Maneuver - Short Range Air Defense (M-SHORAD)	Project (Number/Name) F14 / Maneuver - Short Range Air Defense (M-SHORAD)
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Management	Various	Trident, Intuitive Research and others : Huntsville, Alabama	-	1.699	Mar 2018	2.595	Oct 2018	1.601	Oct 2019	-		1.601	0.000	5.895	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		3.305		-		-		-	0.000	3.305	-
Subtotal			-	1.699		5.900		1.601		-		1.601	0.000	9.200	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Support	MIPR	Aviation and Missiles Research Development and Engineering Center : Redstone Arsenal, AL	-	-		1.781	Oct 2018	1.557	Oct 2019	-		1.557	0.000	3.338	-
System Development, Prototypes and Integration	C/CPAF	Defense Ordnance Technology Consortium (DOTC) (DRS Sustainment Systems, General Dynamics Land Systems and Raytheon Missile systems) : Various	-	14.876	Aug 2018	56.676	Oct 2018	8.925	Oct 2019	5.100	Oct 2019	14.025	0.000	85.577	-
Government Furnished Equipment (GFE)	MIPR	Program Executive Officer Missiles and Space : Various	-	2.374	Jul 2018	4.522	Oct 2018	0.474	Oct 2019	0.900	Oct 2019	1.374	0.000	8.270	-
Subtotal			-	17.250		62.979		10.956		6.000		16.956	0.000	97.185	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / Maneuver - Short Range Air Defense (M-SHORAD)	Project (Number/Name) F14 / Maneuver - Short Range Air Defense (M-SHORAD)
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

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): \$7.050 million FY18, \$30.040 million FY19 and \$3.900 million FY20.
 Platform Integration is by General Dynamics Land Systems (Lima, OH and Anniston, AL): \$7.050 million FY18, \$22.400 million FY19 and \$9.800 million FY20.
 Stinger Missile Launcher is by Raytheon Missile Systems (Tuscon, AZ): \$0.776 million FY18, \$3.881 million FY19 and \$0.325 million FY20.

Significant GFE includes M299 Hellfire launchers, FAAD-C2 systems and radios.
 M299 launchers are by Lockheed Martin Corp. (Orlando, FL): \$1.125 million FY18.
 FAAD-C2 systems and radios are by Northrop Grumman (Redondo Beach, CA): \$1.249 million FY18.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Support Costs	MIPR	Aviation and Missiles Command (AMCOM) : Redstone Arsenal, AL	-	0.252	Jul 2018	3.460	Oct 2018	2.049	Oct 2019	-		2.049	0.000	5.761	-
Subtotal			-	0.252		3.460		2.049		-		2.049	0.000	5.761	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental Testing	MIPR	Redstone Test Center (RTC) and White Sands Missile Range (WSMR) : Redstone, AL and WSMR, NM	-	-		2.386	Oct 2018	9.511	Oct 2019	-		9.511	0.000	11.897	-
Test Support	MIPR	RTC, WSMR, Target Management	-	-		4.291	Oct 2018	8.983	Oct 2019	-		8.983	0.000	13.274	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / Maneuver - Short Range Air Defense (M-SHORAD)	Project (Number/Name) F14 / Maneuver - Short Range Air Defense (M-SHORAD)

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Directed Requirement	▲ 1																											
Initial M-SHORAD Material Development/Integration																												
Initial M-SHORAD Testing																												
Initial M-SHORAD First Unit Equipped (FUE)																												
M-SHORAD Other Transactional Authority (OTA) Award																												
M-SHORAD Design, Development, Prototype Build and Performance Assessment																												
M-SHORAD FUE																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604117A / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>

Schedule Details

Events	Start		End	
	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
Initial M-SHORAD First Unit Equipped (FUE)	2	2021	2	2021
M-SHORAD Other Transactional Authority (OTA) Award	4	2020	4	2020
M-SHORAD Design, Development, Prototype Build and Performance Assessment	4	2020	3	2024
M-SHORAD FUE	4	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604118A / <i>TRACTOR BEAM</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	10.400	52.894	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	63.294
XW0: <i>TRACTOR BEAM</i>	-	10.400	52.894	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	63.294

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	10.400	52.894	0.000	-	0.000
Current President's Budget	10.400	52.894	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	-	-			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	115.116	4.529	119.645	32.150	32.863	21.368	26.627	0.000	232.653
BR2: Advanced Component Development & Prototyping	-	0.000	0.000	115.116	4.529	119.645	32.150	32.863	21.368	26.627	0.000	232.653

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	115.116	4.529	119.645
Total Adjustments	0.000	0.000	115.116	4.529	119.645
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	115.116	4.529	119.645

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	132.810	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	132.810
ED5: <i>Assured Positioning, Navigation and Timing (PNT)</i>	-	21.469	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.469
EH8: <i>DISMOUNTED</i>	-	13.846	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.846
EH9: <i>PSEUDOLITES</i>	-	53.332	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	53.332
EJ2: <i>MOUNTED</i>	-	32.621	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	32.621
EJ3: <i>ANTI-JAM ANTENNA</i>	-	11.542	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.542

Note

Program Element (PE) 0604120A transitioned to PE 1206120A beginning in FY19.

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

Assured Positioning, Navigation and Timing (PNT) will provide the Army's ground maneuver forces access to trusted PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied. Joint Requirements Oversight Council Memo (JROCM) 049-10, dated 05 Apr 2010, approved the Positioning, Navigation and Timing Assurance Initial Capabilities Document and designated the Army as the Lead Component for Assured PNT. The Material Development Decision (MDD) was approved on 30 Jul 2013. The Assured PNT draft Capabilities Development Document was validated by the Army Requirements Oversight Council (AROC) on 28 Jul 2014. The Assured PNT Cross Functional Team is drafting individual Capability Development Documents for each product.

PNT is a critical enabler of many Army systems. The current GPS capability is a fixed frequency system vulnerable to current and emerging threats, and field conditions (e.g. urban, dense vegetation), which means Warfighter assured access and integrity to PNT is not guaranteed. This situation degrades mission performance to an unacceptable level. Therefore, current Army systems cannot operate at the required PNT Assurance Levels with GPS alone.

Assured PNT consists of one project (ED5) Assured PNT and four separate and interdependent PNT products; (EH8) Dismounted A-PNT System, (EH9) Pseudolite, (EJ2) Mounted A-PNT System (MAPS), and (EJ3) Anti-Jam Antenna System (AJAS). These interdependent PNT products assure access to and integrity of PNT information. Each product provides a degree of standalone capability that can be leveraged across the solutions and enterprise enablers to raise the capabilities in all environments and across all formations and warfighting functions. Project Manager (PM) PNT manages these four products (Dismounted A-PNT System, Pseudolite, Mounted A-PNT System (MAPS), and AJAS) constructed to develop, test, field, and sustain the A-PNT materiel solution.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	164.967	0.000	0.000	-	0.000
Current President's Budget	132.810	0.000	0.000	-	0.000
Total Adjustments	-32.157	0.000	0.000	-	0.000
• Congressional General Reductions	-0.114	-			
• Congressional Directed Reductions	-25.000	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-5.479	-			
• Adjustments to Budget Years	-1.564	-	-	-	-

Change Summary Explanation

FY 2018 congressional marks of \$23.679 million and \$1.321 million due to contract delays.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
ED5: Assured Positioning, Navigation and Timing (PNT)	-	21.469	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.469
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

PE 644120ED5 Assured Positioning, Navigation and Timing (PNT) will be funded with a different PE - 146120FJ8 beginning in FY19.

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

Resiliency and Software Assurance Measures (RSAM) provides resiliency and software assurance processes that mitigate risks in a Global Positioning System (GPS)-challenged environment until future Positioning, Navigation and Timing (PNT) solutions are fully implemented. RSAM will result in software security updates for Selective Availability Anti-Spoofing Module (SAASM)-based GPS receivers including the dismounted/mounted Defense Advanced GPS Receiver (DAGR) and the embedded Ground Based-GPS Receiver Applications Module (GB-GRAM)/MicroGRAM, RSAM will coordinate integrated software testing with host platforms and support client systems in synchronizing RSAM deployment to combat forces.

The Assured PNT Enterprise Enabler requirements will be refined by conducting technical demonstrations including Alternative Navigation (ALT NAV) and net-enabled GPS solutions that leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process.

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

	FY 2018	FY 2019	FY 2020
Title: PNT System of System (SOSA) Testing and Resiliency and Software Assurance Modification (RSAM)	21.469	-	-
Description: The effort supports testing of PNT System of Systems Architecture (SOSA) of Army PNT capabilities and Resiliency and Software Assurance Modification (RSAM).			
Accomplishments/Planned Programs Subtotals	21.469	-	-

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

N/A

Remarks

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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
2040 / 4	PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	ED5 / Assured Positioning, Navigation and Timing (PNT)

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 Enabler requirements will be refined by conducting technical demonstrations including Alternative Navigation and net-enabled GPS solutions that leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support	Allot	PM PNT : Various	1.134	1.559	Oct 2017	-		-		-		-	0.000	2.693	-
Subtotal			1.134	1.559		-		-		-		-	0.000	2.693	N/A

Remarks
Program Element (PE) 0604120A project ED5 transitions to PE 1206120A project FJ8 beginning in FY19.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
AM2P - DOTC GPS Receiver Prototypes	C/FFP	Rockwell Collins : Cedar Rapids, IA	0.630	-		-		-		-		-	0.000	0.630	-
AM2P - DOTC GPS Receiver Prototypes	C/CPFF	L-3 IEC : Anaheim, CA	0.600	-		-		-		-		-	0.000	0.600	-
AM2P - DOTC GPS Receiver Prototypes	C/CPFF	EOIR Technologies : Fredericksburg, VA	3.982	-		-		-		-		-	0.000	3.982	-
AM2P - DOTC GPS Receiver Prototypes	C/CPFF	SAVIT : Rockaway, NJ	0.286	-		-		-		-		-	0.000	0.286	-
AM2P - GPS/PGM Integration	MIPR	various : various	2.989	-		-		-		-		-	0.000	2.989	-
Develop Pseudolite Competitive Prototype Contractor 1	C/CPIF	Datapath - Rockwell Collins : Cedar Rapids, IA	3.615	-		-		-		-		-	0.000	3.615	-
Develop Pseudolite Competitive Prototype Contractor 2	C/CPIF	L-3 Communications : Anaheim, CA	3.237	-		-		-		-		-	0.000	3.237	-
RSAM - DAGR Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	-	3.643	Mar 2018	-		-		-		-	0.000	3.643	-
RSAM - GB-GRAM Software Development	SS/CPFF	GCC Technologies : Oakland, MD	2.770	4.516	Jun 2018	-		-		-		-	0.000	7.286	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
RSAM - Develop RSAM Integration Modifications	Various	Various : Various	-	0.476	Mar 2018	-		-		-		-	0.000	0.476	-
Army Modernization Priorities	TBD	Various : Various	-	1.223	Feb 2019	-		-		-		-	0.000	1.223	-
Subtotal			18.109	9.858		-		-		-		-	0.000	27.967	N/A

Remarks
Program Element (PE) 0604120A project ED5 transitions to PE 1206120A project FJ8 beginning in FY19.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Contracting Services	C/FFP	Various : Various	6.186	3.259	Mar 2018	-		-		-		-	0.000	9.445	-
Engineering and Technical Government Services	MIPR	C4ISR : Various	1.852	0.205	Jan 2018	-		-		-		-	0.000	2.057	-
AM2P - Government Eng	MIPR	ARDEC : Picatinny, NJ	3.996	-		-		-		-		-	0.000	3.996	-
AM2P - Joint PGM SME	MIPR	Various : Various	3.441	-		-		-		-		-	0.000	3.441	-
Subtotal			15.475	3.464		-		-		-		-	0.000	18.939	N/A

Remarks
Program Element (PE) 0604120A project ED5 transitions to PE 1206120A project FJ8 beginning in FY19.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
AM2P - Bench Top Component Level Test	MIPR	Various : Various	0.112	-		-		-		-		-	0.000	0.112	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
AM2P - Flight Tests	MIPR	Various : Yuma Proving Ground, AZ	0.780	-		-		-		-		-	0.000	0.780	-
SOSA Testing/RSAM - Government Eng Support	MIPR	Various : Various	0.942	1.885	Mar 2018	-		-		-		-	0.000	2.827	-
SOSA Testing/RSAM - Contractor Eng Support	Various	Various : Various	-	1.278	Mar 2018	-		-		-		-	0.000	1.278	-
Platform Integration Testing	Various	Various : Various	0.500	3.175	Apr 2018	-		-		-		-	0.000	3.675	-
SOSA Testing/RSAM Test Equipment	Various	Various : Various	-	0.250	Aug 2018	-		-		-		-	0.000	0.250	-
Subtotal			2.334	6.588		-		-		-		-	0.000	8.922	N/A

Remarks
Program Element (PE) 0604120A project ED5 transitions to PE 1206120A project FJ8 beginning in FY19.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	37.052	21.469	0.000	-	-	-	0.000	58.521	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) ED5 / <i>Assured Positioning, Navigation and Timing (PNT)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
PNT System of Systems Architecture (SOSA) Testing	[Redacted]				[Redacted]																							
RSAM - DAGR Software Development	[Redacted]				[Redacted]																							
RSAM - GB-GRAM Software Development	[Redacted]				[Redacted]																							
Platform Integration Testing	[Redacted]				[Redacted]																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) ED5 / <i>Assured Positioning, Navigation and Timing (PNT)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
PNT System of Systems Architecture (SOSA) Testing	1	2017	4	2019
RSAM - DAGR Software Development	1	2018	4	2019
RSAM - GB-GRAM Software Development	4	2017	4	2019
Platform Integration Testing	3	2018	4	2019

Note

Program Element (PE) 0604120A project ED5 transitions to PE 1206120A project FJ8 beginning in FY19.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH8 / <i>DISMOUNTED</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EH8: <i>DISMOUNTED</i>	-	13.846	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.846
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

The Dismounted Assured PNT (A-PNT) System acquires, protects, and distributes secure PNT to the Dismounted Soldier. Dismounted A-PNT System will be used in conjunction with the PEO Soldier Nett Warrior System. Dismounted A-PNT System is planned to be modular, scalable form-factor that paces the threats and includes development and integration of Global Positioning System (GPS) and non-GPS sensors. Dismounted A-PNT System includes receiver software capable of acquiring Pseudolite signals resulting in additional integrity for military GPS in denied environments and includes a Military-Code (M-Code) receiver solution with other future technologies.

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

	FY 2018	FY 2019	FY 2020
<i>Title:</i> Dismounted A-PNT System	13.846	-	-
<i>Description:</i> Risk Reduction efforts to reduce technology risk and to determine the appropriate set of technologies to be integrated into the full system.			
Accomplishments/Planned Programs Subtotals	13.846	-	-

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

N/A

Remarks

D. Acquisition Strategy

The goal of the Dismounted A-PNT program is to provide the Soldier conducting operations outside of vehicles unhindered access to trusted PNT under conditions where space based PNT may be limited or denied as well as a means to maintain accurate position, velocity, and time information in Global Positioning System (GPS) challenged or degraded/denied environments. The Dismounted A-PNT capability will provide improved performance and reliability, availability, and maintainability 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 to support the capability development document requirements. This will be implemented by utilizing a competitive Other Transaction Agreement (OTA) contract vehicle to obtain prototypes. The Government will conduct laboratory and performance

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) EH8 / DISMOUNTED

testing. The findings from these test efforts will determine whether or not to proceed to test-fix-test events. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH8 / <i>DISMOUNTED</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Government	Allot	PM PNT : APG, MD	0.425	0.096	May 2018	-		-		-		-	0.000	0.521	-
Project Management Support - Contractor	C/CPFF	Various : Various	0.180	0.248	May 2018	-		-		-		-	0.000	0.428	-
Subtotal			0.605	0.344		-		-		-		-	0.000	0.949	N/A

Remarks
Program Element (PE) 0604120A project EH8 transitions to PE 1206120A project FJ9 beginning in FY19.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development of a Dismounted M-Code capable prototype	C/CPFF	L3, IEC : Anaheim, CA	0.524	8.484	Jun 2018	-		-		-		-	0.000	9.008	-
Development of a small SWAP-C multi sensor navigation prototype	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	1.253	1.513	Apr 2018	-		-		-		-	0.000	2.766	-
Dismounted A-PNT Prototyping & Development	TBD	TBD : TBD	-	3.253	Feb 2019	-		-		-		-	0.000	3.253	-
Subtotal			1.777	13.250		-		-		-		-	0.000	15.027	N/A

Remarks
Program Element (PE) 0604120A project EH8 transitions to PE 1206120A project FJ9 beginning in FY19.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH8 / <i>DISMOUNTED</i>
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	Various	C5ISR : Various	0.425	0.252	Nov 2017	-		-		-		-	0.000	0.677	-
Engineering and Technical Services - Contractor	C/CPFF	Various : Various	0.269	-		-		-		-		-	0.000	0.269	-
Subtotal			0.694	0.252		-		-		-		-	0.000	0.946	N/A

Remarks
Program Element (PE) 0604120A project EH8 transitions to PE 1206120A project FJ9 beginning in FY19.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	3.076	13.846		0.000		-		-		-	0.000	16.922	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH8 / <i>DISMOUNTED</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Dismounted A-PNT Risk Reduction Activities	Risk Reduction Activities																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH8 / <i>DISMOUNTED</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Dismounted A-PNT Risk Reduction Activities	4	2017	2	2019

Note

Program Element (PE) 0604120A project EH8 transitions to PE 1206120A project FJ9 beginning in FY19.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH9 / PSEUDOLITES
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EH9: PSEUDOLITES	-	53.332	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	53.332
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

Highly accurate Positioning, Navigation and Timing (PNT) data is a key enabler and a cross cutting capability for Army forces to execute their mission. The Army requires ground maneuver forces access to trusted PNT information under conditions where space-based PNT may be limited or denied to maintain its Global Positioning System (GPS) military advantage on the battlefield. The current GPS capability is a fixed frequency system which is vulnerable to current and emerging threats and field conditions.

Pseudolite (satellite-like transmitters) assure GPS access and integrity by providing PNT via terrestrial and airborne-based radio navigation GPS transmitters in electronically or physically challenged environments using a higher power signal. Area protection is provided through the deployment of Pseudolite transmitters supporting a Brigade Combat Team area of operations. Pseudolite supports continued operations of PNT-enabled systems such as Blue Force Tracker, Communications Networks and Precision Guided Munitions. Pseudolite consists of three segments:

1. Pseudolite Transmitter segment provides terrestrial and airborne radio navigation (GPS-like) service in electronically or physically challenged environments using a high power signal.
2. Command and Control (C2) segment to control the Pseudolite transmitters on the battlefield.
3. Receiver segment, which will develop software upgrades to current and future military GPS receivers to receive and process the Pseudolite signals.

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

	FY 2018	FY 2019	FY 2020
Title: Pseudolites	53.332	-	-
Description: Pseudolite Technology Maturation and Risk Reduction to reduce technology risk and to determine the appropriate set of technologies to be integrated into the full system.			
Accomplishments/Planned Programs Subtotals	53.332	-	-

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH9 / <i>PSEUDOLITES</i>

D. Acquisition Strategy

The Pseudolite Technology Maturation and Risk Reduction (TMRR) acquisition strategy was approved by the Milestone Decision Authority and Milestone A was successfully completed in May 2015. The Pseudolite product is finalizing the TMRR Phase of the acquisition life-cycle.

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 to support the capability development document requirements. This will be implemented by utilizing an Other Transaction Agreement (OTA) competitive contract vehicle to obtain prototypes. The Government will conduct laboratory and performance testing. The findings from these test efforts will determine whether or not to proceed to test-fix-test events. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) EH9 / PSEUDOLITES
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Government	Allot	PM PNT : APG, MD	1.942	0.326	Feb 2018	-		-		-		-	0.000	2.268	-
Project Management Support - Contractor	C/CPFF	Various : Various	2.238	5.112	Dec 2017	-		-		-		-	0.000	7.350	-
FFRDC	SS/CR	MITRE : Various	0.700	1.200	Mar 2018	-		-		-		-	0.000	1.900	-
Subtotal			4.880	6.638		-		-		-		-	0.000	11.518	N/A

Remarks
Program Element (PE) 0604120A project EH9 transitions to PE 1206120A project FK1 beginning in FY19.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Pseudolite Prototype - Transmitter Contractor 1	C/CPFF	Datapath - Rockwell Collins : Cedar Rapids IA	12.585	-		-		-		-		-	0.000	12.585	-
Pseudolite Prototype - Transmitter Contractor 2	C/CPFF	L-3 Communications : Anaheim, CA	14.027	9.679	Mar 2018	-		-		-		-	0.000	23.706	-
Engineering and Technical Product Support	MIPR	C4ISR : Various	9.042	3.496	Dec 2017	-		-		-		-	0.000	12.538	-
Pseudolite GPS Receiver Upgrade (DAGR & PGK)	SS/CPFF	Various : Various	8.949	5.204	Aug 2018	-		-		-		-	0.000	14.153	-
Pseudolite Command & Control	C/Various	Various : Various	4.231	5.145	May 2018	-		-		-		-	0.000	9.376	-
OEM Platform Integration Development for Air Platform	SS/CPFF	PEO Aviation : Various	2.776	-		-		-		-		-	0.000	2.776	-
PM Platform Integration Development	MIPR	Various : Various	0.200	-		-		-		-		-	0.000	0.200	-
APNT Enterprise Enablers	MIPR	Various : Various	-	15.148	Sep 2018	-		-		-		-	0.000	15.148	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH9 / <i>PSEUDOLITES</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			51.810	38.672		-		-		-		-	0.000	90.482	N/A

Remarks
Program Element (PE) 0604120A project EH9 transitions to PE 1206120A project FK1 beginning in FY19.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	Various	C4ISR : Various	6.294	1.984	Dec 2017	-		-		-		-	0.000	8.278	-
Engineering and Technical Services - Contractor	C/CPFF	Various : Various	9.639	5.239	Dec 2017	-		-		-		-	0.000	14.878	-
Subtotal			15.933	7.223		-		-		-		-	0.000	23.156	N/A

Remarks
Program Element (PE) 0604120A project EH9 transitions to PE 1206120A project FK1 beginning in FY19.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Pseudolite Prototype Lab and Field Testing	MIPR	Various : Various	2.130	0.799	Feb 2018	-		-		-		-	0.000	2.929	-
Subtotal			2.130	0.799		-		-		-		-	0.000	2.929	N/A

Remarks
Program Element (PE) 0604120A project EH9 transitions to PE 1206120A project FK1 beginning in FY19.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		74.753	53.332	0.000	-	-	-	0.000	128.085	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army							Date: March 2019			
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>			Project (Number/Name) EH9 / <i>PSEUDOLITES</i>				
	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH9 / <i>PSEUDOLITES</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Pseudolite (PL) Prototype Development Contractor 1	[Redacted]																											
PL Prototype Dev Ctr 1	[Redacted]																											
Pseudolite (PL) Prototype Development Contractor 2																												
PL Prototype Dev Ctr 2																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EH9 / <i>PSEUDOLITES</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Pseudolite (PL) Prototype Development Contractor 1	3	2015	4	2019
Pseudolite (PL) Prototype Development Contractor 2	3	2015	3	2018

Note

Program Element (PE) 0604120A project EH9 transitions to PE 1206120A project FK1 beginning in FY19.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ2 / <i>MOUNTED</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EJ2: <i>MOUNTED</i>	-	32.621	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	32.621
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

The Mounted Assured Positioning, Navigation and Timing System (MAPS) provides positioning, navigation and timing (PNT) data and is a key enabler and a cross cutting capability for Army ground maneuver forces to execute their mission in support of the Network Enabling Function. Army ground maneuver Forces require access to trusted PNT information under conditions where space-based PNT may be limited or denied to maintain its Global Positioning System (GPS) military advantage on the battlefield. The current GPS capability is a fixed frequency system which is vulnerable to current and emerging threats and field condition.

The MAPS is a scalable, upgradable system mounted on Army ground force platforms. It fuses GPS with complimentary navigation and timing technologies to provide trusted PNT to client systems and platforms. The MAPS distributes PNT data to multiple systems directly and via the network, reducing the dependency on multiple GPS receiver devices on a single platform. In order to achieve performance requirements in the highest threat level conditions, an Anti-Jam Antenna will be integrated with the MAPS. 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 2018	FY 2019	FY 2020
Title: Mounted A-PNT System	32.621	-	-
Description: Risk Reduction efforts to reduce technology risk and to determine the appropriate set of technologies to be integrated into the full system. Also, the entrance into an Other Transaction Agreement (OTA) competitive contract vehicle to obtain prototypes for testing, platform integration, and client system integration.			
Accomplishments/Planned Programs Subtotals	32.621	-	-

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

N/A

Remarks

D. Acquisition Strategy

The goal of the Mounted A-PNT program is to deliver distributed A-PNT capabilities to mounted platforms over time in an iterative, affordable manner. 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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ2 / <i>MOUNTED</i>
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and operational suitability and equipped to select critical units to support the stand-alone requirements of Requirements Definition Package (RDP) 1. This will be implemented by utilizing an Other Transaction Agreement (OTA) competitive contract vehicle to obtain prototypes. The Government will conduct Electromagnetic Interference and Environmental Testing as well as performance testing in the System Integration Lab (SIL) and anechoic chamber testing. The findings from these test efforts will determine whether or not to proceed to test fix test events and begin platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) EJ2 / MOUNTED
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Government	Allot	PM PNT : APG, MD	0.383	1.116	Nov 2017	-		-		-		-	0.000	1.499	-
Project Management Support - Contractor	C/CPFF	Various : Various	0.238	0.170	Dec 2017	-		-		-		-	0.000	0.408	-
FFRDC	SS/CR	MITRE : Various	1.450	0.300	Sep 2018	-		-		-		-	0.000	1.750	-
Subtotal			2.071	1.586		-		-		-		-	0.000	3.657	N/A

Remarks
Program Element (PE) 0604120A project EJ2 transitions to PE 1206120A project FK2 beginning in FY19.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Prototype Development Contractor 1	C/CPFF	Rockwell Collins : Cedar Rapids, IA	0.555	2.720	Dec 2017	-		-		-		-	0.000	3.275	-
Prototype Development Contractor 2	C/CPFF	Northrup Grumman : San Diego, CA	-	0.438	Dec 2017	-		-		-		-	0.000	0.438	-
Prototype Development Contractor 3	C/CPFF	GPS Source : Pueblo, CO	1.234	-		-		-		-		-	0.000	1.234	-
Engineering and Technical Product Support	MIPR	C4ISR : Various	1.805	2.293	Nov 2017	-		-		-		-	0.000	4.098	-
Development of the Systems Engineering and Integration Lab	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	0.965	7.060	Dec 2017	-		-		-		-	0.000	8.025	-
Stryker Integration	C/CPFF	General Dynamics Land Systems : Sterling Heights MI	2.214	5.746	Aug 2018	-		-		-		-	0.000	7.960	-
Mounted and AJAS Prototype Development	C/Various	TBD : TBD	-	7.400	Dec 2018	-		-		-		-	0.000	7.400	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) EJ2 / MOUNTED
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			6.773	25.657	-	-	-	-	-	-	-	-	0.000	32.430	N/A

Remarks
Program Element (PE) 0604120A project EJ2 transitions to PE 1206120A project FK2 beginning in FY19.
On schedule for competitive award of the Mounted and Anti-Jam Antenna System (AJAS) prototype development contract.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	Various	C5ISR : various	1.267	0.497	Nov 2017	-	-	-	-	-	-	-	0.000	1.764	-
Engineering and Technical Services - Contractor	C/CPFF	Various : Various	3.210	2.196	Dec 2017	-	-	-	-	-	-	-	0.000	5.406	-
Subtotal			4.477	2.693	-	-	-	-	-	-	-	-	0.000	7.170	N/A

Remarks
Program Element (PE) 0604120A project EJ2 transitions to PE 1206120A project FK2 beginning in FY19.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test Support - Contractor	C/CPFF	Various : Various	0.786	0.164	Dec 2017	-	-	-	-	-	-	-	0.000	0.950	-
ED3 Operational Needs Statement (ONS) Testing	TBD	ATEC : MD, AZ	-	2.331	Jun 2018	-	-	-	-	-	-	-	0.000	2.331	-
ALT NAV Performance Testing	TBD	Dept of Energy (DOE) and CERDEC : MD, SC	-	0.190	Jun 2018	-	-	-	-	-	-	-	0.000	0.190	-
Subtotal			0.786	2.685	-	-	-	-	-	-	-	-	0.000	3.471	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ2 / <i>MOUNTED</i>
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

Remarks
Program Element (PE) 0604120A project EJ2 transitions to PE 1206120A project FK2 beginning in FY19.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.107	32.621	0.000	-	-	-	0.000	46.728	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ2 / <i>MOUNTED</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Mounted A-PNT Risk Reduction Activities	[Redacted]				[Redacted]																							
ED3 ONS Testing	[Redacted]				[Redacted]																							
ALT NAV Performance Testing	[Redacted]				[Redacted]																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ2 / <i>MOUNTED</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Mounted A-PNT Risk Reduction Activities	4	2017	1	2019
ED3 ONS Testing	3	2018	4	2018
ALT NAV Performance Testing	3	2018	4	2018

Note

Program Element (PE) 0604120A project EJ2 transitions to PE 1206120A project FK2 beginning in FY19.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ3 / ANTI-JAM ANTENNA
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EJ3: ANTI-JAM ANTENNA	-	11.542	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	11.542
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Network Enabling Functions (Assured PNT).

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 deployed as a scalable component accessory to the Mounted Assured Positioning, Navigation and Timing System (MAPS).

The MAPS is a scalable, upgradable system mounted on Army ground force platforms. It fuses GPS with complimentary navigation and timing technologies to provide trusted PNT to client systems and platforms. The MAPS distributes Positioning, Navigation and Timing (PNT) data to multiple systems directly and via the network, reducing the dependency on multiple GPS receiver devices on a single platform. In order to achieve performance requirements in the highest threat level conditions, an Anti-Jam Antenna will be integrated with the MAPS. These two products each provide a degree of Assured-Positioning, Navigation and Timing (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 2018	FY 2019	FY 2020
Title: Anti-Jam Antenna System	11.542	-	-
Description: Risk reduction activities associated with the AJAS prototypes is to reduce technology risk and to determine the appropriate set of technologies to be integrated into the full system. The initiation of Other Transaction Agreement (OTA) competitive contract vehicle to obtain prototypes for test, user assessment and platform integration.			
Accomplishments/Planned Programs Subtotals	11.542	-	-

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. 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 to support the stand-alone requirements of Requirements Definition Package (RDP) 1.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ3 / <i>ANTI-JAM ANTENNA</i>
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This will be implemented by utilizing an Other Transaction Agreement (OTA) competitive contract vehicle to obtain prototypes. The Government will conduct partial Electromagnetic Interference and Environmental Testing as well as performance testing in the System Integration Lab (SIL) and anechoic chamber testing. The findings from these test efforts will determine whether or not to proceed to test-fix-test events and begin platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) EJ3 / ANTI-JAM ANTENNA
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Government	Allot	PM PNT : APG, MD	-	0.015	Nov 2017	-		-		-		-	0.000	0.015	-
Project Management Support - Contractor	C/CPFF	Various : Various	-	0.921	Dec 2017	-		-		-		-	0.000	0.921	-
FFRDC	SS/CR	MITRE : Various	-	0.862	May 2018	-		-		-		-	0.000	0.862	-
Subtotal			-	1.798		-		-		-		-	0.000	1.798	N/A

Remarks
Program Element (PE) 0604120A project EJ3 transitions to PE 1206120A project FK3 beginning in FY19.

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Product Support	MIPR	C5ISR : Various	-	1.292	Dec 2017	-		-		-		-	0.000	1.292	-
Mounted and AJAS Prototype Development	C/Various	TBD : TBD	-	5.320	Dec 2018	-		-		-		-	0.000	5.320	-
ALT NAV Enterprise Enablers	MIPR	CERDEC CP&I : APG, MD	-	2.802	Sep 2018	-		-		-		-	0.000	2.802	-
Subtotal			-	9.414		-		-		-		-	0.000	9.414	N/A

Remarks
Program Element (PE) 0604120A project EJ3 transitions to PE 1206120A project FK3 beginning in FY19.
On schedule for competitive award of the Mounted and Anti-Jam Antenna System (AJAS) prototype contract.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ3 / <i>ANTI-JAM ANTENNA</i>
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Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Anti-Jam Antenna Live Sky Demo and Anechoic Chamber Test	MIPR	CERDEC - Command Power and Integration Directorate : APG, MD	-	0.330	Jul 2018	-		-		-		-	0.000	0.330	-
Subtotal			-	0.330		-		-		-		-	0.000	0.330	N/A

Remarks
Program Element (PE) 0604120A project EJ3 transitions to PE 1206120A project FK3 beginning in FY19.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	11.542	0.000	-	-	-	0.000	11.542	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ3 / <i>ANTI-JAM ANTENNA</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Anti-Jam Antenna Risk Reduction Activities																												
Risk Reduction Activities																												
ALT NAV Enterprise Enablers																												
ALT NAV Enterprise Enablers																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) EJ3 / ANTI-JAM ANTENNA

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Anti-Jam Antenna Risk Reduction Activities	1	2018	1	2019
ALT NAV Enterprise Enablers	1	2018	4	2018

Note

Program Element (PE) 0604120 project EJ3 transitions to PE 1206120A project FK3 beginning in FY19.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	109.165	39.890	136.761	-	136.761	22.672	10.668	7.735	7.896	0.000	334.787
FD6: <i>Synthetic Training Environment Refine & Prototype</i>	-	109.165	39.890	41.676	-	41.676	15.672	10.668	7.735	7.896	0.000	232.702
SV1: <i>Soldier/Squad Virtual Trainer</i>	-	0.000	0.000	95.085	-	95.085	7.000	0.000	0.000	0.000	0.000	102.085

A. Mission Description and Budget Item Justification

The Synthetic Training Environment (STE) is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight with, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. STE will be a common synthetic environment enabled by a core of Global Terrain/One World Terrain (OWT); common authoritative data and models; Training Simulation Software (TSS), and Training Management Tools (TMT). The STE will be available where training occurs (Home Station, Armories, Institutions, Shipboard, Deployed) and will include Air and Ground Reconfigurable Virtual Collective Trainers (RVCTs) and a Soldier/Squad Virtual Training (S/SVT) close combat training capability. The first increment of the SSVT is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS). The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, including Live and Constructive. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle; a Secretary of Defense priority.

FY 2020 base funding of \$136.761 million will continue to develop and demonstrate prototype designs to reduce technical risk, validate designs, validate cost estimates, evaluate processes, and refine requirements for STE, support development and integration of the first increment of the S/SVT, which is an embedded STE training capability that includes OWT, TSS, TMT, into the operational capability of the IVAS. Based on these refined requirements and demonstrated prototype designs, integrated systems design of the end-item system can be initiated. Additionally, these efforts ensure the level of expertise required to operate and maintain the capability is consistent with the force structure. Increments 2 and 3 of SSVT provides the NEXTGEN Marksmanship and the NEXTGEN Call For Fire Artillery Virtual Training capability into the STE baseline. The SSVT system also combines individual Soldier and squad training capabilities (STE Squad Capability (SSC), Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF)), into a single capability.

Funds were realigned from PE 0604715A in FY 2019 and 2020 for the first increment of the SSVT which is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.600	77.939	56.867	-	56.867
Current President's Budget	109.165	39.890	136.761	-	136.761
Total Adjustments	107.565	-38.049	79.894	-	79.894
• Congressional General Reductions	-0.001	-0.049			
• Congressional Directed Reductions	-	-38.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	107.629	-			
• SBIR/STTR Transfer	-0.063	-			
• Adjustments to Budget Years	-	-	79.894	-	79.894

Change Summary Explanation

Funds were realigned from FY 2019 and 2020 for the first increment of the SSVT which is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS). The FY 2020 increase of \$79.894 million supports the Army's modernization priorities in support of the National Defense Strategy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>					Project (Number/Name) FD6 / <i>Synthetic Training Environment Refine & Prototype</i>		
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FD6: <i>Synthetic Training Environment Refine & Prototype</i>	-	109.165	39.890	41.676	-	41.676	15.672	10.668	7.735	7.896	0.000	232.702
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Synthetic Training Environment (STE) is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight with, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. STE will be a common synthetic environment enabled by a core of Global Terrain/One World Terrain (OWT); common authoritative data and models; Training Simulation Software (TSS), and Training Management Tools (TMT). The STE will be available where training occurs (Home Station, Armories, Institutions, Shipboard, Deployed) and will include Air and Ground Reconfigurable Virtual Collective Trainers (RVCTs) and a Soldier/Squad Virtual Training (S/SVT) close combat training capability, and a live training capability. The first increment of the SSVT is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS). The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, including Live and Constructive. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle; a Secretary of Defense priority.

FY 2020 base funding of \$41.676 million will continue to develop and demonstrate prototype designs to reduce technical risk, validate designs, validate cost estimates, evaluate processes, and refine requirements for STE, support development and integration of the first increment of the S/SVT, which is an embedded STE training capability that includes OWT, TSS, TMT, into the operational capability of the IVAS. Based on these refined requirements and demonstrated prototype designs, integrated systems design of the end-item system can be initiated. Additionally, these efforts ensure the level of expertise required to operate and maintain the capability is consistent with the force structure.

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

	FY 2018	FY 2019	FY 2020
Title: Program Management	1.536	5.791	3.528
Description: Will provide program management, engineering and technical oversight, contract support, and travel for the development of the program.			
FY 2019 Plans: Funding will be used for program execution of rapid prototyping which allows refinement of the requirement for the capability that will be acquired. Funds also support the translation of validated capability gaps into system specific requirements, including the Key Performance Parameters (KPPs) and Key System Attributes (KSAs). Efforts facilitate refinement and decisions on the acquisition strategy for the capability.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>	Project (Number/Name) FD6 / <i>Synthetic Training Environment Refine & Prototype</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Funding will be used for program execution of rapid prototyping which allows refinement of the requirement for the capability that will be acquired. Funds also support the translation of validated capability gaps into system specific requirements, including the Key Performance Parameters (KPPs) and Key System Attributes (KSAs). Efforts facilitate refinement and decisions on the acquisition strategy for the capability.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease in FY20 funding aligns program funds to the program management requirements.</p>			
<p>Title: Engineering, Support, Test & Evaluation</p> <p>Description: Will provide Engineering, support, and any related test and evaluation for the development of the program.</p> <p>FY 2019 Plans: FY 2019 funding develops and demonstrates prototype designs to reduce technical risk, validates designs, validates cost estimates, evaluates processes, and refines requirements. Based on refined requirements, demonstrated prototype designs and User Assessments of the prototypes an integrated systems prototype design of the end-item system can be initiated through an OTA. Additionally, these efforts ensure the level of expertise required to operate and maintain the capability remains within the defined force structure.</p> <p>FY 2020 Plans: FY 2020 funding will continue to develop, demonstrate, and conduct User Assessments of prototype designs to reduce technical risk, validate designs, validate cost estimates, evaluate processes, and refine requirements. Based on refined requirements and demonstrated prototype designs, integrated systems design of the end-item system can be continued through an OTA. Additionally, these efforts ensure the level of expertise required to operate and maintain the capability remains within the defined force structure.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase in FY20 funding is due to the integration of the live capability into the STE, per the Secretary of the Army's guidance.</p>	107.629	34.099	38.148
Accomplishments/Planned Programs Subtotals	109.165	39.890	41.676

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• NA2020: <i>Synthetic Training Environment (STE)</i>	-	-	20.749	-	20.749	70.978	70.887	72.969	66.683	0.000	302.266

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>	Project (Number/Name) FD6 / <i>Synthetic Training Environment Refine & Prototype</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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Remarks

D. Acquisition Strategy

The Synthetic Training Environment (STE) program will employ an incremental acquisition strategy where the full capability will occur in multiple increments as new capability is developed and delivered. Initial competitive prototyping development efforts will be conducted through Other Transactional Authority (OTA) awards resulting in system prototypes that reduce program risk and technology maturation risk.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Management Services	Various	PEO STRI : Orlando, FL	-	1.536		5.791		3.528		-		3.528	3.357	14.212	Continuing
Subtotal			-	1.536		5.791		3.528		-		3.528	3.357	14.212	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Product Development	TBD	To Be Determined : To Be Determined	-	107.629		32.906		37.523		-		37.523	37.773	215.831	Continuing
Subtotal			-	107.629		32.906		37.523		-		37.523	37.773	215.831	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Support Costs	TBD	To Be Determined : To Be Determined	-	-		1.193		0.625		-		0.625	0.841	2.659	Continuing
Subtotal			-	-		1.193		0.625		-		0.625	0.841	2.659	N/A

Project Cost Totals	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	109.165	39.890	41.676	-	41.676	41.971	232.702	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
CDD					1 CDD																							
Acquisition Entry Point					2 AEP																							
IOC					3 IOC																							
Other Transaction Authority 1					OTA 1																							
OTA Tech Insertion												Tech Insertion																
Integration Contract												Integration																
Production															Production													

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>	Project (Number/Name) FD6 / <i>Synthetic Training Environment Refine & Prototype</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
CDD	2	2019	2	2019
Acquisition Entry Point	1	2020	1	2020
IOC	4	2021	4	2021
Other Transaction Authority 1	2	2018	4	2021
OTA Tech Insertion	4	2021	4	2024
Integration Contract	2	2020	4	2024
Production	2	2021	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>					Project (Number/Name) SV1 / <i>Soldier/Squad Virtual Trainer</i>		
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
SV1: <i>Soldier/Squad Virtual Trainer</i>	-	0.000	0.000	95.085	-	95.085	7.000	0.000	0.000	0.000	0.000	102.085
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
S/SVT is not a New Start for FY2020. The program was previously funded under PE 0604715A.

A. Mission Description and Budget Item Justification

The Synthetic Training Environment (STE) is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight with, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi-Domain Operations. STE will be a common synthetic environment enabled by a core of Global Terrain/One World Terrain (OWT); common authoritative data and models; Training Simulation Software (TSS), and Training Management Tools (TMT). The STE will be available where training occurs (Home Station, Armories, Institutions, Shipboard, Deployed) and will include Air and Ground Reconfigurable Virtual Collective Trainers (RVCTs) and a Soldier/Squad Virtual Training (S/SVT) close combat training capability, and a live training capability. The first increment of the SSVT is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS). The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, including Live and Constructive. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle; a Secretary of Defense priority.

FY 2020 base funding of \$95.085 million will continue to develop and demonstrate prototype designs to reduce technical risk, validate designs, validate cost estimates, evaluate processes, refine requirements, and support development and integration of the first increment of the S/SVT, which is an embedded STE training capability that includes OWT, TSS, TMT, into the operational capability of the IVAS. Based on these refined requirements and demonstrated prototype designs, integrated systems design of the end-item system can be initiated. Additionally, these efforts ensure the level of expertise required to operate and maintain the capability is consistent with the force structure.

The first increment of the SSVT which is the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the integrated Visual Augmentation System (IVAS). Increments 2 and 3 of SSVT provides the NEXTGEN Marksmanship and the NEXTGEN Call For Fire Artillery Virtual Training capability into the STE baseline. The SSVT system also combines individual Soldier and squad training capabilities (STE Squad Capability (SSC), Weapon Skill Development (WSD), Joint Fires Training (JFT), and Use of Force (UoF)), into a single capability.

S/SVT is not a New Start for FY2020. The program was previously funded under PE 0604715A.

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

	FY 2018	FY 2019	FY 2020
Title: Engineering, Support, Test & Evaluation	-	-	95.085

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>	Project (Number/Name) SV1 / <i>Soldier/Squad Virtual Trainer</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: Will provide Engineering, support, and any related test and evaluation for the development of the program.</p> <p>FY 2020 Plans: FY 2020 funds the remaining two capability sets of the Squad immersive Virtual Trainer (SiVT) capability and the Heads Up Display (HUD) 3.0 which comprises the Integrated Visual Augmentation System (IVAS) and will continue to develop, demonstrate, and conduct User Assessments of prototype designs to reduce technical risk, validate designs, validate cost estimates, evaluate processes, and refine requirements. Based on refined requirements and demonstrated prototype designs, integrated systems design of the end-item system can be continued through an OTA.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase in FY20 funding is due to the requirement for the accelerated Research and Development for IVAS, per the Secretary of the Army's and Secretary of Defense's guidance, as well as the SVT integration.</p>				
Accomplishments/Planned Programs Subtotals		-	-	95.085
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
The Synthetic Training Environment (STE) program will employ an incremental acquisition strategy where the full capability will occur in multiple increments as new capability is developed and delivered. Soldier and Squad Virtual Trainer (S/SVT) program will employ an incremental acquisition strategy where the full capability will occur in multiple increments as new capability is developed and delivered. Initial competitive prototyping development efforts will be conducted through Other Transactional Authority (OTA) awards resulting in system prototypes that reduce program risk and technology maturation risk.				
E. Performance Metrics				
N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army													Date: March 2019		
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)						
2040 / 4				PE 0604121A / Synthetic Training Environment Refinement & Prototyping					SV1 / Soldier/Squad Virtual Trainer						
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	Aberdeen Proving Grounds : MD	-	-		-		95.085		-		95.085	0.000	95.085	-
Subtotal			-	-		-		95.085		-		95.085	0.000	95.085	N/A
Project Cost Totals			-	-		0.000		95.085		-		95.085	0.000	95.085	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>		Project (Number/Name) SV1 / <i>Soldier/Squad Virtual Trainer</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
IVAS/HUD 3.0	[Redacted]				[Redacted]																							
SVT	[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]				[Redacted]							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604121A / <i>Synthetic Training Environment Refinement & Prototyping</i>	Project (Number/Name) SV1 / <i>Soldier/Squad Virtual Trainer</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
IVAS/HUD 3.0	2	2018	1	2021
SVT	2	2019	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604182A / <i>Hypersonics</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	228.000	-	228.000	181.000	137.000	359.000	274.000	0.000	1,179.000
HX1: <i>Land-Based Hypersonic Missile</i>	-	0.000	0.000	228.000	-	228.000	181.000	137.000	359.000	274.000	0.000	1,179.000

Note

This program is a new start beginning in FY 2020.

A. Mission Description and Budget Item Justification

B. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	228.000	-	228.000
Total Adjustments	0.000	0.000	228.000	-	228.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	228.000	-	228.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / Hypersonics	Project (Number/Name) HX1 / Land-Based Hypersonic Missile
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
HX1: Land-Based Hypersonic Missile	-	0.000	0.000	228.000	-	228.000	181.000	137.000	359.000	274.000	0.000	1,179.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a New program beginning in FY2020.

A. Mission Description and Budget Item Justification

This Program Element (PE) funds hypersonic development efforts performed by the US Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT).

Project HX1: Funds USASMDC/ARSTRAT to prototype a Long Range Hypersonic Weapon (LRHW) System is to provide the Army with 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 sensitive targets. The LRHW Integrated System contractor will integrate Common Hypersonic Glide Bodies (CHGBs) with 2 stage boosters into canisters to create LRHW All Up Rounds (AUR) as detailed in the following sections and a build a prototype LRHW System. A leave behind prototype LRHW system is expected as an Early Operational Capability (EOC).

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

	FY 2018	FY 2019	FY 2020
Title: Land Based Hypersonic Missile	-	-	228.000
Description: Funding is provided for planning,.			
FY 2020 Plans: The Army Hypersonic Project Office will work with the Weapon System Integration Contractor to get through Systems Requirements Review and move towards a Preliminary Design Review for the system. Funding will be used to order CHGBs and boosters for integration into All Up Rounds starting in FY21.			
FY 2019 to FY 2020 Increase/Decrease Statement: New program for FY2020			
Accomplishments/Planned Programs Subtotals	-	-	228.000

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / <i>Hypersonics</i>	Project (Number/Name) HX1 / <i>Land-Based Hypersonic Missile</i>
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D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604182A / Hypersonics				HX1 / Land-Based Hypersonic Missile							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
.Government Personnel and Operations Support	TBD	.SMDC/ARSTRAT Huntsville AL : .	-	-		-		20.000		-		20.000	0.000	20.000	-
Subtotal			-	-		-		20.000		-		20.000	0.000	20.000	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
.Contracts for Technology Development, and weapon system design, integration, and prototyping	TBD	.TBD : .	-	-		-		208.000		-		208.000	0.000	208.000	-
Subtotal			-	-		-		208.000		-		208.000	0.000	208.000	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
.	TBD	. : .	-	-		-		0.000		-		0.000	-	-	-
Subtotal			-	-		-		0.000		-		0.000	-	-	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
.	TBD	. : .	-	-		-		0.000		-		0.000	-	-	-
Subtotal			-	-		-		0.000		-		0.000	-	-	N/A
Project Cost Totals			-	-		0.000		228.000		-		228.000	0.000	228.000	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / <i>Hypersonics</i>	Project (Number/Name) HX1 / <i>Land-Based Hypersonic Missile</i>
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	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / <i>Hypersonics</i>	Project (Number/Name) HX1 / <i>Land-Based Hypersonic Missile</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Systems Requirement Review																												
Preliminary Design Review																												
Critical Design Review																												
All Up Round Test																												
System Flight Test																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604182A / <i>Hypersonics</i>	Project (Number/Name) HX1 / <i>Land-Based Hypersonic Missile</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Systems Requirement Review	2	2020	4	2020
Preliminary Design Review	4	2020	1	2022
Critical Design Review	1	2022	4	2022
All Up Round Test	4	2022	1	2023
System Flight Test	1	2023	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0604319A / Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	10.871	40.979	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	51.850
DU3: IFPC2	-	10.871	40.979	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	51.850

Program MDAP/MAIS Code: Pre

Note

Starting in FY 2017, IFPC Inc 2-I Block 1 system development funding has been realigned from BA4, PE 0604319/DU3 to BA5, PE 0605052/EY7.

In FY 2018 and FY 2019, funding is programmed for Expanded Mission Area Missile (EMAM) interceptor.

EMAM program funding for FY 2020 and out has been transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1)

A. Mission Description and Budget Item Justification

The 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 Indirect Fire Protection Capability Increment 2 (IFPC Inc 2) will provide a ground-based weapon system designed to acquire, track, engage, and defeat the Cruise Missiles (CM), Unmanned Aircraft Systems (UAS), and Rockets, Artillery, and Mortar (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. The EMAM program supports IFPC Inc 2 by providing a kinetic interceptor capability against CM, UAS, and enabling an initial counter-Rocket, Artillery, and Mortar (RAM) capability. The IFPC Inc 2 and EMAM systems will be integrated with the Army Integrated Air and Missile Defense (AIAMD) Command and Control (C2) architecture.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	11.303	51.030	146.731	-	146.731
Current President's Budget	10.871	40.979	0.000	-	0.000
Total Adjustments	-0.432	-10.051	-146.731	-	-146.731
• Congressional General Reductions	-0.009	-0.051			
• Congressional Directed Reductions	-	-10.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.423	-			
• Adjustments to Budget Years	-	-	-146.731	-	-146.731

Change Summary Explanation

FY 2020 adjustments included a \$22.500 million decrease in the Portfolio Director's Review, a transfer of \$124.228 million to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1), and a reduction of \$0.003 million to adjust for pay inflation.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
DU3: IFPC2	-	10.871	40.979	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	51.850
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note
Starting in FY 2017, IFPC Inc 2-I Block 1 system development funding has been realigned from BA4, PE 0604319/DU3 to BA5, PE 0605052/EY7.

In FY 2018 and FY 2019, funding is programmed for Expanded Mission Area Missile (EMAM) interceptor.

EMAM program funding for FY 2020 and out has been transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1)

CFT Supported, IFPC Inc 2 - Block 1.

A. Mission Description and Budget Item Justification

The 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 Indirect Fire Protection Capability Increment 2 (IFPC Inc 2) will provide a ground-based weapon system designed to acquire, track, engage, and defeat the Cruise Missiles (CM), Unmanned Aircraft Systems (UAS), and Rocket, Artillery, and Mortar (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. The EMAM program supports IFPC Inc 2 by providing a kinetic interceptor capability against CM, UAS, and enabling an initial counter-Rocket, Artillery, and Mortar (RAM) capability. The IFPC Inc 2 and EMAM 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: System Engineering & Program Management (SEPM)	6.071	14.459	-	-	-
Description: Funding is provided for systems engineering, integration, logistics engineering, system test and management efforts.					
FY 2019 Plans:					
- Continue RDT&E efforts associated with Second interceptor					
- Perform system engineering, integration, logistics engineering, system test and evaluation management, technical configuration control, cost and business management activities					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>		Project (Number/Name) DU3 / <i>IFPC2</i>	
B. Accomplishments/Planned Programs (\$ in Millions)					
<ul style="list-style-type: none"> - Conduct system technical reviews and program management reviews to include Design Review 2, Systems Requirement Review (SRR) and Systems Functional Review (SFR) of 3 Vendors - Develop Tailored Acquisition Strategy - Verify Technology Readiness - Down Selection process from 3 Vendors to 1 Vendor for Material Solution. - Conduct Preliminary Design Review (PDR) - Perform technical assessments, concept studies, cost reduction, risk reduction, and required documentation for Milestone B Decision - Conduct program decision preparation, Milestone B documentation, Source Selection documentation and execution activities <p>FY 2019 to FY 2020 Increase/Decrease Statement: PE 0604319/DU3 has no FY 2020 base dollars budgeted - funding transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1).</p>					
<p>Title: Engineering and Technical Support</p> <p>Description: Funding is provided for engineering and technical support for the design of system hardware, software, and integration requirements.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue Second Interceptor engineering and technical support for design of system hardware, software, and integration requirements - Develop Tailored Acquisition Strategy - Verify Technology Readiness - Down Selection process from 3 Vendors to 1 Vendor for Material Solution. - Conduct Preliminary Design Review (PDR) - Perform technical assessments, concept studies, cost reduction, risk reduction, and required documentation for Milestone B Decision - Conduct program decision preparation, Milestone B documentation, Source Selection documentation and execution activities Participate in system technical and program management reviews - Preparation of Milestone B Decision Briefings and Documentation. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>					
	0.200	1.252	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>	Project (Number/Name) DU3 / <i>IFPC2</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
PE 0604319/DU3 has no FY 2020 base dollars budgeted because funding transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1).					
<p>Title: System/Subsystem Development and Integration</p> <p>Description: Funding is provided for hardware and software integration activities, technical assessments, concept studies, and integration and risk reduction.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue Second Interceptor hardware and software integration activities - Participate in system technical and program management reviews - Perform technical assessments, concept studies, cost reduction, required documentation, integration and component risk reduction - Develop Tailored Acquisition Strategy - Verify Technology Readiness - Down Selection process from 3 Vendors to 1 Vendor for Material Solution. - Conduct Preliminary Design Review (PDR) - Conduct program decision preparation, Milestone B documentation, Source Selection documentation. - Preparation of Milestone B Decision Briefings and Documentation. <p>FY 2019 to FY 2020 Increase/Decrease Statement: PE 0604319/DU3 has no FY 2020 base dollars budgeted because funding transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1).</p>	4.191	21.732	-	-	-
<p>Title: System/Subsystem Developmental Testing</p> <p>Description: Funding is provided for developmental testing activities, modeling and simulation test activities, and cyber security test activities.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue Developmental testing activities - Continue Modeling and Simulation test activities - Continue Cyber Security test activities - Participate in system technical and program management reviews - Perform technical assessments, concept studies, cost reduction, required documentation, integration and component risk reduction 	0.409	1.713	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>	Project (Number/Name) DU3 / <i>IFPC2</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<ul style="list-style-type: none"> - Develop Tailored Acquisition Strategy - Verify Technology Readiness - Down Selection process from 3 Vendors to 1 Vendor for Material Solution. - Conduct Preliminary Design Review (PDR) - Conduct program decision preparation, Milestone B documentation, Source Selection documentation. <p>FY 2019 to FY 2020 Increase/Decrease Statement: PE 0604319/DU3 has no FY 2020 base dollars budgeted because funding transferred to BA5 PE 655052/EY7 (IFPC Increment 2 - Block 1).</p> <p>Title: FY 2019 SBIR/ STTR Transfer</p> <p>Description: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>	-	1.823	-	-	-
Accomplishments/Planned Programs Subtotals	10.871	40.979	-	-	-

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• C53101: <i>MSE Missile</i>	1,103.040	1,131.276	0.000	736.541	736.541	767.495	749.530	999.731	898.131	793.430	7,179.174
• 0205456A: <i>Lower Tier Air and Missile Defense (AMD) System</i>	69.558	77.188	107.746	-	107.746	111.080	121.308	37.186	40.999	Continuing	Continuing
• 0604114A: <i>Lower Tier Air Missile Defense (LTAMD) Sensor</i>	57.437	89.248	427.772	-	427.772	376.738	332.322	241.461	87.500	0.000	1,612.478
• C50016: <i>System Integration and Test Procurement</i>	136.579	105.395	0.000	113.857	113.857	105.044	107.288	86.178	87.410	Continuing	Continuing
• 0605052A: <i>Indirect Fire Protection Capability Inc 2 - Block 1</i>	156.361	132.283	243.228	-	243.228	101.000	58.000	45.000	5.000	0.000	740.872
• C62002: <i>IFPC INC 2- I BLOCK 1 SYSTEM</i>	-	31.286	0.000	9.337	9.337	241.387	446.464	424.568	446.541	0.000	1,599.583

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>	Project (Number/Name) DU3 / <i>IFPC2</i>
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C. Other Program Funding Summary (\$ in Millions)

Line Item	FY 2018	FY 2019	FY 2020	FY 2020	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Cost To	
			Base	OCO	Total					Complete	Total Cost
• C61001: <i>INDIRECT FIRE PROTECTION CAPABILITY INC 2-I</i>	50.056	176.922	0.000	9.337	9.337	241.387	446.464	424.568	446.541	Continuing	Continuing
• E10: <i>Sentinel</i>	31.651	39.289	105.243	-	105.243	103.427	105.394	65.574	69.407	0.000	519.985
• S40: <i>Army Integrated Air and Missile Defense</i>	339.051	322.263	208.938	-	208.938	130.859	63.738	33.193	94.845	0.000	1,192.887
• BZ5075: <i>IAMD Battle Command System</i>	-	-	29.629	-	29.629	254.834	353.929	417.426	413.775	Continuing	Continuing
• 0604741A: <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	190.385	212.373	43.502	-	43.502	24.944	7.068	1.228	3.405	0.000	482.905
• AD5070: <i>AIR & MSL Defense Planning & Control Sys</i>	132.713	29.913	24.730	14.331	39.061	49.147	106.671	63.143	0.075	0.000	420.723

Remarks

This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.

D. Acquisition Strategy

The EMAM 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 1QFY2020. The program will conduct Engineering and Manufacturing Development through the end of FY 2022, Milestone C in 1QFY2023, and Initial Operational Test & Evaluation in FY 2023.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management Admin (IFPC Base System)	MIPR	Cruise Missile Defense Systems Project Office : Huntsville, Alabama	28.644	-		-		-		-		-	Continuing	Continuing	Continuing
Program Management Admin	Various	Multiple Activities : Redstone Arsenal, Alabama	-	4.471	Oct 2017	5.753	Oct 2018	-		-		-	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.823		-		-		-	0.000	1.823	-
Subtotal			28.644	4.471		7.576		-		-		-	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
System Engineering & Integration (IFPC Base System)	MIPR	Cruise Missile Defense Systems Project Office : Huntsville, AL	54.463	-		-		-		-		-	Continuing	Continuing	Continuing
System Engineering & Integration	Various	Multiple Activities : Huntsville, AL	-	1.600	Oct 2017	3.871	Oct 2018	-		-		-	Continuing	Continuing	Continuing
Engineering and Technical Support (IFPC Base System)	MIPR	Multiple Activities : Multiple Locations	140.824	-		-		-		-		-	Continuing	Continuing	Continuing
Engineering and Technical Support	Various	Multiple Activities : Multiple Locations	-	0.200	Oct 2017	1.252	Oct 2018	-		-		-	Continuing	Continuing	Continuing
System/Subsystem Development and Integration (IFPC Base System)	MIPR	Multiple Activities : Multiple Locations	120.035	-		-		-		-		-	Continuing	Continuing	Continuing
System/Subsystem Development and Integration	C/CPPF	TBD : Multiple Locations	-	4.191	Jan 2018	21.732	Feb 2019	-		-		-	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604319A / Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)				DU3 / IFPC2							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			315.322	5.991		26.855		-		-		-	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Log Support	Various	Multiple Activities : Redstone Arsenal, Alabama	-	-		1.934	Oct 2018	-		-		-	0.000	1.934	-
Subtotal			-	-		1.934		-		-		-	0.000	1.934	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
System/Subsystem Developmental Testing	MIPR	Multiple Activities : Multiple Locations	-	0.409	Oct 2017	1.713	Oct 2018	-		-		-	Continuing	Continuing	Continuing
Developmental Testing Support	Various	Multiple Activities : Redstone Arsenal, Alabama	-	-		2.901	Oct 2018	-		-		-	Continuing	Continuing	Continuing
Subtotal			-	0.409		4.614		-		-		-	Continuing	Continuing	N/A
Project Cost Totals			343.966	10.871		40.979		-		-		-	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>	Project (Number/Name) DU3 / <i>IFPC2</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
EMAM Program Decision (Design Review 1)				1																								
EMAM Integration & Testing																												
EMAM Pre-MS B Activities																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604319A / <i>Indirect Fire Protection Capability Increment 2-Intercept (IFPC2)</i>	Project (Number/Name) DU3 / <i>IFPC2</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
EMAM Program Decision (Design Review 1)	1	2019	1	2019
EMAM Integration & Testing	4	2018	4	2019
EMAM Pre-MS B Activities	1	2018	4	2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604403A / <i>Future Interceptor</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	8.000	-	8.000	8.000	8.000	88.918	120.000	Continuing	Continuing
FM3: <i>Future Interceptor</i>	-	0.000	0.000	8.000	-	8.000	8.000	8.000	88.918	120.000	Continuing	Continuing

Note

This is a new program beginning in FY2020.

A. Mission Description and Budget Item Justification

The Lower Tier Future Interceptor program will provide improved operational effectiveness against evolving air and missile 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. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	8.000	-	8.000
Total Adjustments	0.000	0.000	8.000	-	8.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	8.000	-	8.000

Change Summary Explanation

This is a new program beginning in FY 2020.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604403A / <i>Future Interceptor</i>				Project (Number/Name) FM3 / <i>Future Interceptor</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FM3: <i>Future Interceptor</i>	-	0.000	0.000	8.000	-	8.000	8.000	8.000	88.918	120.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project is a new start beginning in FY 2020.

A. Mission Description and Budget Item Justification

Lower Tier Future Interceptor program will provide improved operational effectiveness against evolving air and missile 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 2018	FY 2019	FY 2020
Title: Program Development and Support	-	-	8.000
Description: Provide program development and support for the Lower Tier Future Interceptor program, including technical work, concept development, modeling & simulation work, and other related efforts.			
FY 2020 Plans: FY2020 Plans include: -Developing the Analysis of Alternatives (AoA) -Working on the Competitive concept developments through Other Transaction Agreements (OTA). -Initiating Modeling & Simulation development for enhanced system effectiveness assessment.			
FY 2019 to FY 2020 Increase/Decrease Statement: New program line beginning in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	8.000

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

N/A

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 development (CD) with multiple contractors. From the CD phase, rapid prototype development approaches will utilize detailed modeling and simulation of the future

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army Date: March 2019

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
2040 / 4	PE 0604403A / <i>Future Interceptor</i>	FM3 / <i>Future Interceptor</i>

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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604403A / <i>Future Interceptor</i>	Project (Number/Name) FM3 / <i>Future Interceptor</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PAC-3 Product Office	MIPR	Project Office : Huntsville, AL	-	-		-		0.350	Dec 2019	-		0.350	0.000	0.350	-
Subtotal			-	-		-		0.350		-		0.350	0.000	0.350	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SETA	Various	Multiple : Multiple	-	-		-		0.900	Feb 2020	-		0.900	0.000	0.900	-
US Other Government Agencies (OGA)	MIPR	Various : Huntsville, AL	-	-		-		6.750	Jan 2020	-		6.750	0.000	6.750	-
Subtotal			-	-		-		7.650		-		7.650	0.000	7.650	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	0.000	8.000	-	8.000	0.000	8.000	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604403A / <i>Future Interceptor</i>	Project (Number/Name) FM3 / <i>Future Interceptor</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Material Development Decision (MDD)									▲ 1	Material Development Decision (MDD)																		
Analysis of Alternatives									Analysis of Alternatives																			
Concept Development									Concept Development																			
Lower Tier Future Interceptor CDD													Lower Tier Future Interceptor CDD															
Competitive RFP																	Competitive RFP											
Contract Award Downselect																					Contract Award Downselect							
Milestone A																					Milestone A							
Modeling & Simulation Development									Modeling & Simulation Development																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604403A / <i>Future Interceptor</i>	Project (Number/Name) FM3 / <i>Future Interceptor</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Matériel Development Decision (MDD)	2	2020	2	2020
Analysis of Alternatives	2	2020	2	2021
Concept Development	2	2020	1	2023
Lower Tier Future Interceptor CDD	2	2021	2	2022
Competitive RFP	3	2022	2	2023
Contract Award Downselect	2	2023	2	2023
Milestone A	2	2023	2	2023
Modeling & Simulation Development	2	2020	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	39.600	-	39.600	41.400	41.000	41.050	41.050	Continuing	Continuing
BT1: <i>Interoperability</i>	-	0.000	0.000	6.900	-	6.900	7.213	7.213	7.213	7.213	Continuing	Continuing
BT2: <i>Command Post Mobility/ Survivability</i>	-	0.000	0.000	7.400	-	7.400	7.736	7.736	7.736	7.736	Continuing	Continuing
BT3: <i>Common Operating Environment (COE)</i>	-	0.000	0.000	5.800	-	5.800	6.065	6.065	6.065	6.065	Continuing	Continuing
BT4: <i>Network Technology Maturation Initiatives (NTMI)</i>	-	0.000	0.000	3.200	-	3.200	3.200	3.200	3.200	3.200	Continuing	Continuing
BT5: <i>Integrated Tactical Network/Enterprise Network</i>	-	0.000	0.000	16.300	-	16.300	17.186	16.786	16.836	16.836	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

The Network Cross-Functional Team (N-CFT) narrows assigned Army capability gaps using Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities - Policy (DOTMLPF-P) enhancements to enable overmatch. The N-CFT engages in expert analysis, focused experiments, and technology demonstrations to narrow capability gaps. Subsequent to a materiel development decision, the N-CFT develops and refines capability documentation aligned with the appropriate phase of the program. The N-CFT will inform technology transitions, research and development, and user assessments, and then rapidly transition Operational Requirements into the Army Acquisition System. The N-CFT will integrate and synchronize activities across the Army, tied to Joint requirements, focused to improve speed, capability, and cost of materiel solutions to meet the Chief of Staff of the Army's (CSA's) first order principles, characteristics, and Warfighting requirements.

Unified Network Transport supports the Army's Network Modernization Strategy Line Of Effort (LOE) 1 - Unified Network; LOE 2 - Common Operating Environment (COE); LOE 3 - Interoperability; and LOE 4 - Command Post Mobility and Survivability. Funds will (1) identify and acquire technologies to address identified gaps across the Lines of Effort in the Integrated Tactical Network/Enterprise Network, Tactical Network Transport, Computing Environments, Interoperability and Command Posts, and (2) conduct demonstrations and experimental testing in lab and operational environments on the technologies. Successful solutions identified through the experimentation will be transitioned to Programs of Record for integration and fielding. Funds for experimentation will also support integration with solutions identified in the other Modernization CFT efforts to ensure their network dependencies are addressed.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	39.600	-	39.600
Total Adjustments	0.000	0.000	39.600	-	39.600
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	39.600	-	39.600

Change Summary Explanation

N/A: FY20 New Start Program

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>				Project (Number/Name) BT1 / <i>Interoperability</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BT1: <i>Interoperability</i>	-	0.000	0.000	6.900	-	6.900	7.213	7.213	7.213	7.213	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY20.

Project BT1 is Interoperability which supports N-CFT LOE 3

Project BT2 is Command Post Mobility/Survivability which supports N-CFT LOE 4

Project BT3 is Common Operating Environment which supports N-CFT LOE 2

Project BT4 is Network Technology Maturation Initiatives which supports N-CFT LOE 1 through 4

Project BT5 is Integrated Tactical Network/Integrated Enterprise Network which supports N-CFT LOE 1

A. Mission Description and Budget Item Justification

LOE 3 (Interoperability) 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.

This funding is used to identify and acquire technologies to enhance or address gaps associated with LOE 3, Interoperability, solutions for experimentation that will incorporate abilities to leverage common commercial standards and/or widely recognized military interoperability standards. This funding will support demonstrations and experimentations, 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; digital fires; and sustainment.

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

	FY 2018	FY 2019	FY 2020
Title: BT1: Interoperability	-	-	6.900
Description: This funding is used to identify and acquire technologies to enhance or address gaps associated with LOE 3, Interoperability, solutions for experimentation that will incorporate abilities to leverage common commercial standards and/or widely recognized military interoperability standards. This funding will support demonstrations and experimentations, 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; digital fires; and sustainment.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT1 / <i>Interoperability</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY 20 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 experimentation. FY20 funding supports joint interoperability assessment during JWA 20 and DEFENDER 20. Subsequent funding support enables the Army to identify potential solutions for the following: enabling technologies to support the Army operating in an MPE; a deployed Army solution to extend episodic MPEs into the tactical network; and implementing solutions to UAP information exchange gaps (data, message and waveform Interoperability). Technologies with successful results will be transitioned in FY21-25 to a rapid acquisition initiative or into an existing PoR strategy. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> N/A FY20 New Start			
Accomplishments/Planned Programs Subtotals	-	-	6.900

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604541A / Unified Network Transport				BT1 / Interoperability							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Management Office Support	TBD	TBD : TBD	-	-		-		0.500		-		0.500	0.000	0.500	-
Subtotal			-	-		-		0.500		-		0.500	0.000	0.500	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM	TBD	TBD : TBD	-	-		-		4.500		-		4.500	0.000	4.500	-
Subtotal			-	-		-		4.500		-		4.500	0.000	4.500	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Engineering and Technical Support	TBD	TBD : TBD	-	-		-		0.900		-		0.900	0.000	0.900	-
Subtotal			-	-		-		0.900		-		0.900	0.000	0.900	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Test and Evaluation	TBD	TBD : TBD	-	-		-		1.000		-		1.000	0.000	1.000	-
Subtotal			-	-		-		1.000		-		1.000	0.000	1.000	N/A
Project Cost Totals			-	-		0.000		6.900		-		6.900	0.000	6.900	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT1 / <i>Interoperability</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
TEM (Technical Exchange Meeting) - Emerging Technology Projects																												
JWA 20													Capability Gap Reduction and Enhancement Development Effort 1 Joint Warfighter Assessment															
Defender 20													2 EUCOM Exercise															

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT1 / <i>Interoperability</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
TEM (Technical Exchange Meeting) - Emerging Technology Projects	1	2020	4	2025
JWA 20	3	2020	3	2020
Defender 20	4	2020	4	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 SW/HW enhancements for PORs.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT2 / <i>Command Post Mobility/Survivability</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BT2: <i>Command Post Mobility/Survivability</i>	-	0.000	0.000	7.400	-	7.400	7.736	7.736	7.736	7.736	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY20.

Project BT1 is Interoperability which supports N-CFT LOE 3

Project BT2 is Command Post Mobility/Survivability which supports N-CFT LOE 4

Project BT3 is Common Operating Environment which supports N-CFT LOE 2

Project BT4 is Network Technology Maturation Initiatives which supports N-CFT LOE 1 through 4

Project BT5 is Integrated Tactical Network/Integrated Enterprise Network which supports N-CFT LOE 1

A. Mission Description and Budget Item Justification

LOE4, Command Posts (CPs), establishes capabilities that enable the ability to employ CPs for operations from early entry to major combat operations. This LOE includes the ability to develop and disseminate a common operating picture, conduct planning and collaboration, synchronize operations, and modify and reduce the electronic and physical signatures. Solutions to solve current issues of lengthy set-up and tear-down times, survivability, mobility, suitability and physical size are also resolved in this LOE. A key deliverable is an integrated body of requirements that meet operational needs in all aspects of CP operations.

This funding is used to identify and acquire technologies for experimentation that enhance or address gaps associated with LOE 4, Command Post, in the overall Integrated Tactical Network. The Command Post 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 a Deployable, Integrated, and Mobile Command Post and integrates Knowledge Management.

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

	FY 2018	FY 2019	FY 2020
Title: BT2 Command Post Mobility and Survivability	-	-	7.400
Description: This funding is used to identify and acquire technologies for experimentation that enhance or address gaps associated with LOE 4, Command Post, in the overall Integrated Tactical Network. The Command Post 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:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT2 / <i>Command Post Mobility/Survivability</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY20 funding initiates survivable command post solutions that enable dispersed CP footprint, reduced CP EM vulnerability, and extensible CP decoys for deception. Also, subsequent funding will support experimentation that identifies 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 in FY21-25 into an existing PoR strategy for integration and fielding. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> N/A FY20 New Start			
Accomplishments/Planned Programs Subtotals	-	-	7.400

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0604541A / Unified Network Transport				BT2 / Command Post Mobility/Survivability								
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Project Management Office Support	TBD	TBD : TBD	-	-		-		0.600		-		0.600	0.000	0.600	-	
Subtotal			-	-		-		0.600		-		0.600	0.000	0.600	N/A	
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
TEM	TBD	TBD : TBD	-	-		-		5.000		-		5.000	0.000	5.000	-	
Subtotal			-	-		-		5.000		-		5.000	0.000	5.000	N/A	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
CP Engineering/Technical Support	TBD	TBD : TBD	-	-		-		1.000		-		1.000	0.000	1.000	-	
Subtotal			-	-		-		1.000		-		1.000	0.000	1.000	N/A	
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
CP Test and Evaluation	TBD	TBD : TBD	-	-		-		0.800		-		0.800	0.000	0.800	-	
Subtotal			-	-		-		0.800		-		0.800	0.000	0.800	N/A	
Project Cost Totals			-	-		0.000		7.400		-		7.400	0.000	7.400	N/A	
Remarks																

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT2 / <i>Command Post Mobility/Survivability</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Node to Node Connectivity Solutions																												
CP Antenna Remoting																												
Integrated CP Decoy Platform																												
TEM (Technical Exchange Meeting) - Emerging Technology Projects																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT2 / <i>Command Post Mobility/Survivability</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Node to Node Connectivity Solutions	3	2020	4	2022
CP Antenna Remoting	1	2020	4	2021
Integrated CP Decoy Platform	2	2020	4	2022
TEM (Technical Exchange Meeting) - Emerging Technology Projects	1	2020	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 SW/HW enhancements for PORs.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>				Project (Number/Name) BT3 / <i>Common Operating Environment (COE)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BT3: <i>Common Operating Environment (COE)</i>	-	0.000	0.000	5.800	-	5.800	6.065	6.065	6.065	6.065	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY20.

Project BT1 is Interoperability which supports N-CFT LOE 3

Project BT2 is Command Post Mobility/Survivability which supports N-CFT LOE 4

Project BT3 is Common Operating Environment which supports N-CFT LOE 2

Project BT4 is Network Technology Maturation Initiatives which supports N-CFT LOE 1 through 4

Project BT5 is Integrated Tactical Network/Integrated Enterprise Network which supports N-CFT LOE 1

A. Mission Description and Budget Item Justification

LOE 2, 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.

Funding enhances Common Operating Environment Interoperability by enabling integration into the Joint Information Environment (JIE) and the Mission Partner Environment (MPE). N-CFT COE enhancements will demonstrate a simple and intuitive single mission command suite (single common operating picture of common unified data and geospatial standards) installed, operated and maintained by soldiers, and standardized mission command applications and knowledge management capabilities that support leaders and Soldiers across echelons to enable all warfighting functions.

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

	FY 2018	FY 2019	FY 2020
Title: BT3 Common Operating Environment	-	-	5.800
Description: This funding is used to identify and acquire technologies to enhance or address gaps associated with LOE 2, Common Operating Environment, 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 FY21.			
FY 2020 Plans:			
FY20 funding supports assessment and experimentation 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			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT3 / <i>Common Operating Environment (COE)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Tactical Endpoint Security. Technologies with successful results will be transitioned in FY21/22 to a rapid acquisition initiative or into an existing PoR strategy. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> N/A FY20 New Start			
Accomplishments/Planned Programs Subtotals	-	-	5.800

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604541A / Unified Network Transport				BT3 / Common Operating Environment (COE)							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		-		0.500		-		0.500	0.000	0.500	-
Subtotal			-	-		-		0.500		-		0.500	0.000	0.500	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM	TBD	TBD : TBD	-	-		-		4.000		-		4.000	0.000	4.000	-
Subtotal			-	-		-		4.000		-		4.000	0.000	4.000	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
COE Engineering/ Technical Support	TBD	TBD : TBD	-	-		-		0.500		-		0.500	0.000	0.500	-
Subtotal			-	-		-		0.500		-		0.500	0.000	0.500	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
COE Test and Evaluation	TBD	TBD : TBD	-	-		-		0.800		-		0.800	0.000	0.800	-
Subtotal			-	-		-		0.800		-		0.800	0.000	0.800	N/A
Project Cost Totals			-	-		0.000		5.800		-		5.800	0.000	5.800	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army							Date: March 2019			
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>			Project (Number/Name) BT3 / <i>Common Operating Environment (COE)</i>				

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks									

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT3 / <i>Common Operating Environment (COE)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
GRiD Tactical																					Integrate maturing GeoINT Tradecraft and multi-INT							
E2E GeoINT									Prototype E2E forward solution																			
TEM (Technical Exchange Meeting) - Emerging Technology Projects																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT3 / <i>Common Operating Environment (COE)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
GRiD Tactical	1	2023	4	2024
E2E GeoINT	1	2023	4	2024
TEM (Technical Exchange Meeting) - Emerging Technology Projects	1	2020	2	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 SW/HW enhancements for PORs.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>				Project (Number/Name) BT4 / <i>Network Technology Maturation Initiatives (NTMI)</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BT4: <i>Network Technology Maturation Initiatives (NTMI)</i>	-	0.000	0.000	3.200	-	3.200	3.200	3.200	3.200	3.200	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY20.

Project BT1 is Interoperability which supports N-CFT LOE 3

Project BT2 is Command Post Mobility/Survivability which supports N-CFT LOE 4

Project BT3 is Common Operating Environment which supports N-CFT LOE 2

Project BT4 is Network Technology Maturation Initiatives which supports N-CFT LOE 1 through 4

Project BT5 is Integrated Tactical Network/Integrated Enterprise Network which supports N-CFT LOE 1

A. Mission Description and Budget Item Justification

This funding is used to acquire and transition DARPA and SCO RDT&E efforts. This funding will be used to evaluate and transition DARPA SHARE and SCO's LTE programs (including future OSD RDT&E initiatives and projects). In addition, this funding provides support required to conduct technical exchanges that provide opportunities to identify and acquire technologies for demonstrations, experimentations and prototyping. Funding provides engineering and programmatic support required for execution of lab-based and operational field experimentation and assessment.

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

	FY 2018	FY 2019	FY 2020
Title: BT4: Network Technology Maturation Initiatives (NTMI)	-	-	3.200
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 experimentation. In addition, this funding is used to acquire and transition of DARPA and SCO RDT&E efforts.			
FY 2020 Plans: This funding provides support required to identify successful solutions for transition into the tactical network through programs of record. FY20 funding supports lab-based and field experimentation of commercial solutions and solutions derived from OSD RDT&E programs (DARPA Share and SCO LTE programs).			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT4 / <i>Network Technology Maturation Initiatives (NTMI)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
N/A FY20 New Start			
Accomplishments/Planned Programs Subtotals	-	-	3.200

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT4 / <i>Network Technology Maturation Initiatives (NTMI)</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Office Support	TBD	TBD : TBD	-	-		-		0.250		-		0.250	0.000	0.250	-
Subtotal			-	-		-		0.250		-		0.250	0.000	0.250	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
NTMI Engineering/ Technical Support	TBD	TBD : TBD	-	-		-		2.500		-		2.500	0.000	2.500	-
Subtotal			-	-		-		2.500		-		2.500	0.000	2.500	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
NTMI Test and Evaluation	TBD	TBD : TBD	-	-		-		0.450		-		0.450	0.000	0.450	-
Subtotal			-	-		-		0.450		-		0.450	0.000	0.450	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	3.200	-	3.200	0.000	3.200	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT4 / <i>Network Technology Maturation Initiatives (NTMI)</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
SCO LTE Program									2 OT																			
DARPA SHARE									1 DT																			
TEM (Technical Exchange Meeting) - Emerging Technology Projects Support (Lab)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT4 / <i>Network Technology Maturation Initiatives (NTMI)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SCO LTE Program	4	2020	4	2020
DARPA SHARE	4	2019	4	2019
TEM (Technical Exchange Meeting) - Emerging Technology Projects Support (Lab)	1	2020	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>				Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BT5: <i>Integrated Tactical Network/Enterprise Network</i>	-	0.000	0.000	16.300	-	16.300	17.186	16.786	16.836	16.836	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY20.

Project BT1 is Interoperability which supports N-CFT LOE 3

Project BT2 is Command Post Mobility/Survivability which supports N-CFT LOE 4

Project BT3 is Common Operating Environment which supports N-CFT LOE 2

Project BT4 is Network Technology Maturation Initiatives which supports N-CFT LOE 1 through 4

Project BT5 is Integrated Tactical Network/Integrated Enterprise Network which supports N-CFT LOE 1

A. Mission Description and Budget Item Justification

Unified Network, enables a converged Mission Command Network that operates seamlessly worldwide and in any environment. This effort has three components: Integrated Tactical Network, Network Enablers and Integrated Enterprise Network. 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.

This funding is used to identify and acquire technologies to enhance or address gaps associated with LOE 1, Unified Network, for experimentation 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. It will increase bandwidth and range; improve mobility and network security; and harden the network. 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.

LOE 1 enhancements include Aerial Tier (WGS Ka Band Surrogate), CEMA resiliency, and cyber hardened communications.

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

	FY 2018	FY 2019	FY 2020
Title: Project BT5: Integrated Tactical Network/Integrated Enterprise Network	-	-	16.300

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>

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

Description: This funding is used to identify and acquire technologies to enhance or address gaps associated with LOE 1, Unified Network, for experimentation 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:

FY20 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 experimentation 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 provided 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 in FY21-25 to a rapid acquisition initiative or into an existing PoR strategies.

FY 2019 to FY 2020 Increase/Decrease Statement:

N/A FY20 New Start Program

FY 2018	FY 2019	FY 2020
-	-	16.300

Accomplishments/Planned Programs Subtotals

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604541A / Unified Network Transport				BT5 / Integrated Tactical Network/Enterprise Network							
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management Office Support	TBD	TBD : TBD	-	-		-		1.000		-		1.000	0.000	1.000	-
Subtotal			-	-		-		1.000		-		1.000	0.000	1.000	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM Development	TBD	TBD : TBD	-	-		-		10.800		-		10.800	0.000	10.800	-
Subtotal			-	-		-		10.800		-		10.800	0.000	10.800	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TEM Engineering Technical Support	TBD	TBD : TBD	-	-		-		2.000		-		2.000	0.000	2.000	-
Subtotal			-	-		-		2.000		-		2.000	0.000	2.000	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	TBD	TBD : TBD	-	-		-		2.500		-		2.500	0.000	2.500	-
Subtotal			-	-		-		2.500		-		2.500	0.000	2.500	N/A
Project Cost Totals			-	-		0.000		16.300		-		16.300	0.000	16.300	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>
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	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
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<u>Remarks</u>

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Tactical IDaM									■																							
Protected Comms for MUM-T													■																			
Unified NetOps													■																			
Network Centric WF Resilient																					■											
Next Gen HF																					■											
Spectrum Obfuscation																					■											
Protected SATCOM																					■											
Cyber SU																					■											
WGS Ka Band Surrogate																									■							
GRiD Tactical																									■							
Aerial Tier Networking																													■			
TEM (Technical Exchange Meeting) - Emerging Technology Projects																	■				■				■				■			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604541A / <i>Unified Network Transport</i>	Project (Number/Name) BT5 / <i>Integrated Tactical Network/Enterprise Network</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Tactical IDaM	1	2020	4	2020
Protected Comms for MUM-T	2	2020	4	2020
Unified NetOps	2	2020	1	2021
Network Centric WF Resilient	2	2021	4	2021
Next Gen HF	2	2021	4	2023
Spectrum Obfuscation	3	2021	4	2021
Protected SATCOM	3	2021	3	2022
Cyber SU	3	2021	1	2022
WGS Ka Band Surrogate	2	2022	1	2023
GRiD Tactical	3	2022	1	2023
Aerial Tier Networking	3	2023	4	2025
TEM (Technical Exchange Meeting) - Emerging Technology Projects	1	2020	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 SW/HW enhancements for PORs.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604644A / <i>Mobile Medium Range Missile</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	20.000	-	20.000	90.000	190.000	300.000	300.000	0.000	900.000
MR1: <i>Mobile Medium Range Missile</i>	-	0.000	0.000	20.000	-	20.000	90.000	190.000	300.000	300.000	0.000	900.000

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.

B. Program Change Summary (\$ in Millions)

	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	20.000	-	20.000
Total Adjustments	0.000	0.000	20.000	-	20.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	20.000	-	20.000

Change Summary Explanation

FY 2020 funding increase due to initial funding for new start program.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604644A / <i>Mobile Medium Range Missile</i>	Project (Number/Name) MR1 / <i>Mobile Medium Range Missile</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
MR1: <i>Mobile Medium Range Missile</i>	-	0.000	0.000	20.000	-	20.000	90.000	190.000	300.000	300.000	0.000	900.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

Mobile Medium Range Missile is a new start.

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.

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

	FY 2018	FY 2019	FY 2020
Title: TM/RR	-	-	20.000
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: Supports acquisition strategy development, system requirements/specification definition/development, transitioned technology/component maturation assessment, and contract strategy development.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding for this new start begins in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	20.000

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.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604644A / <i>Mobile Medium Range Missile</i>	Project (Number/Name) MR1 / <i>Mobile Medium Range Missile</i>

E. Performance Metrics
N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604644A / <i>Mobile Medium Range Missile</i>	Project (Number/Name) MR1 / <i>Mobile Medium Range Missile</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	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				
Transition (Current and Planned Technologies)									██████████				██████████				██████████															
Assessment																	██████████															
TM/RR																					██████████				██████████				██████████			
MDD (MS A)																					▲ 1											
Mission Command Development																					██████████				██████████				██████████			
IDR																									▲ 2							
Component Maturation																					██████████				██████████				██████████			
PDR																													▲ 3			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604644A / <i>Mobile Medium Range Missile</i>	Project (Number/Name) MR1 / <i>Mobile Medium Range Missile</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Transition (Current and Planned Technologies)	1	2020	4	2022
Assessment	2	2020	4	2020
TM/RR	1	2021	4	2024
MDD (MS A)	3	2021	3	2021
Mission Command Development	3	2021	4	2024
IDR	4	2022	4	2022
Component Maturation	4	2021	4	2024
PDR	4	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	0.000	2.000	2.000	2.020	2.040	2.040	2.081	0.000	10.181
DS4: <i>Integrated Base Defense</i>	-	0.000	0.000	0.000	2.000	2.000	2.020	2.040	2.040	2.081	0.000	10.181

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 FY18 and 0205402A in FY19.

Request for FY2020 OCO is \$2.000M to support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	0.000	2.000	2.000
Total Adjustments	0.000	0.000	0.000	2.000	2.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	0.000	2.000	2.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>	
<u>Change Summary Explanation</u> Counter Vehicle Borne Improvised Explosive Device (CVBIED) is not a new start, the program was moved from Program Element 0605033A in FY18 and 0205402A in FY19.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>				Project (Number/Name) DS4 / <i>Integrated Base Defense</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
DS4: <i>Integrated Base Defense</i>	-	0.000	0.000	0.000	2.000	2.000	2.020	2.040	2.040	2.081	0.000	10.181
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 FY18 and 0205402A in FY19.

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.

Request for FY2020 OCO is \$2.000M to support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CVBIED Design and Build	-	-	0.000	2.000	2.000
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 Base Plans: Funding support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540.					
FY 2020 OCO Plans: Funding support continued integration of CVBIED technologies into the current Force Protection infrastructure to address capabilities gaps within JUONS CC-0540.					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>	Project (Number/Name) DS4 / <i>Integrated Base Defense</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The Counter Vehicle Borne Improvised Explosive Device (CVBIED) program was funded in Program Element 0605033A in FY18 and Program Element 0205402A EF2 in FY19.					
Accomplishments/Planned Programs Subtotals	-	-	0.000	2.000	2.000

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0205402A: <i>Integrated Base Defense - Operational System Dev</i>	-	8.000	0.000	-	0.000	-	-	-	-	0.000	8.000
• 0605033A: <i>Ground-Based Operational Surveillance System - Expeditionary (GBOSS-E)</i>	20.661	5.169	3.847	-	3.847	5.981	-	-	-	0.000	35.658

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).

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense</i> (<i>Budget Activity 4</i>)	Project (Number/Name) DS4 / <i>Integrated Base Defense</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JUONS CC-0540 System Integration	MIPR	AMRDEC : Huntsville, AL	-	-		-		0.000		0.379	Jan 2020	0.379	Continuing	Continuing	Continuing
JUONS CC-0540 Hyper spectral Sensor Development Support	MIPR	RDECOM CERDEC : Fort Belvoir, VA	-	-		-		0.000		0.203	Jan 2020	0.203	Continuing	Continuing	Continuing
JUONS CC-0540 Wide Area Motion Imagery Sensor Development	MIPR	NAVAIR : Patuxent River, MD	-	-		-		0.000		0.608	Jan 2020	0.608	Continuing	Continuing	Continuing
Subtotal			-	-		-		0.000		1.190		1.190	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test and Evaluation	MIPR	ATEC : Aberdeen Proving Ground, MD	-	-		-		0.000		0.810	Jan 2020	0.810	Continuing	Continuing	Continuing
Subtotal			-	-		-		0.000		0.810		0.810	Continuing	Continuing	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	0.000	0.000	2.000	2.000	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>	Project (Number/Name) DS4 / <i>Integrated Base Defense</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Development, Test and Integration																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604785A / <i>Integrated Base Defense (Budget Activity 4)</i>	Project (Number/Name) DS4 / <i>Integrated Base Defense</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Development, Test and Integration	1	2020	2	2022

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	56.071	52.817	52.102	-	52.102	53.578	54.697	55.463	56.018	0.000	380.746
FA8: <i>Cyberspace Operations Forces and Force Support</i>	-	56.071	52.817	52.102	-	52.102	53.578	54.697	55.463	56.018	0.000	380.746

A. Mission Description and Budget Item Justification

Persistent Cyber Training Environment (PCTE) will provide the Department of Defense (DoD) cyber forces with a standardized training capability with access to existing Cyber Training Ranges (CTR) and available training resources and content. The current environment does not have the capacity to maintain a persistent environment and is primarily used for major exercises (i.e. Cyber Flag). The service cyber components have established their own training environments but do not have standardized capabilities or content. PCTE system approaches are aligned to the outputs of the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD AT&L) 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. Program is directed by the 2016 National Defense Authorization Act, Section 1645.

FY 2020 will focus on the requirements of the PCTE fielded capabilities, the build out of Technical Operations Management, and the extension of the PCTE to the National Guard and Reserve Cyber Mission Force teams.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	56.492	65.817	65.102	-	65.102
Current President's Budget	56.071	52.817	52.102	-	52.102
Total Adjustments	-0.421	-13.000	-13.000	-	-13.000
• Congressional General Reductions	-0.009	-	-	-	-
• Congressional Directed Reductions	-	-13.000	-	-	-
• Congressional Rescissions	-	-	-	-	-
• Congressional Adds	-	-	-	-	-
• Congressional Directed Transfers	-	-	-	-	-
• Reprogrammings	-	-	-	-	-
• SBIR/STTR Transfer	-0.412	-	-	-	-
• Adjustments to Budget Years	-	-	-13.000	-	-13.000

Change Summary Explanation

FY 2018 Congressional Rescission of \$5.676M.

FY 2020 decrease reflects Cyber Operational Risk Assessment-Programs (CORA-P) funding realignment to program element 0606942A project FL2.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>				Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FA8: <i>Cyberspace Operations Forces and Force Support</i>	-	56.071	52.817	52.102	-	52.102	53.578	54.697	55.463	56.018	0.000	380.746
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Persistent Cyber Training Environment (PCTE) will provide the Department of Defense (DoD) cyber forces with a standardized training capability with access to existing Cyber Training Ranges (CTR) and available training resources and content. The current environment does not have the capacity to maintain a persistent environment and is primarily used for major exercises (i.e. Cyber Flag). The service cyber components have established their own training environments but do not have standardized capabilities or content. PCTE system approaches are aligned to the outputs of the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD AT&L) 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. Program is directed by the 2016 National Defense Authorization Act, Section 1645.

FY2020 will focus on the requirements of the PCTE fielded capabilities, the build out of Technical Operations Management, and the extension of the PCTE to the National Guard and Reserve CMF teams.

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

	FY 2018	FY 2019	FY 2020
Title: Event Management for Persistent Cyber Training Environment (PCTE)	18.600	23.400	25.600
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 2019 Plans: Event management capabilities will continue to build on previous year's efforts by introducing new capability and continuing to refine those already integrated based on Cyber Mission Forces' (CMF) evaluations. The Program Management Office will continue development, integration, and evaluation of prototype applications that will satisfy the PCTE requirement gaps and meet the IOC definition. This includes training package development, event scheduling and event execution. Through this, Cyber Mission Forces will be provided the ability to plan, design, execute and assess training.			
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 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
The increase for Event Management is due to the implementation of the material solution for the Technical Operations Management capability.				
<p>Title: Environment Operations and Management for Persistent Cyber Training Environment (PCTE)</p> <p>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.</p> <p>FY 2019 Plans: Continue building emulated environments and the hybrid cloud environment with the participating cyber ranges to support team/group, and force level training events. The emulated environments includes the emulation of blue, red, green, and gray networks as well as the ability to replicate Industrial Control Systems (ICS) and Supervisory Control and Data Acquisition (SCADA) environments. These environments provide the "maneuver" space and training grounds for Cyber Mission Forces (CMF). Fund the virtual connections with the PCTE in order for the CMF trainee to choose the maneuver environment while establishing the training event. This will also include the ability to sanitize the environment at the completion of training so that the next student has a neutral environment. This will include the ability to use current threat information and intelligence to ensure that the environments remain current and relevant providing a realistic training environment.</p> <p>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.</p>		14.130	13.400	13.400
<p>Title: Physical and Virtual Connectivity for the Persistent Cyber Training Environment (PCTE)</p> <p>Description: On-Demand reliable, secure physical and virtual global access from wherever participants are geographically located. A core cyber exercise network and event management platform with access to the full suite of DoD, Service, Interagency, Multinational, and State distributed systems.</p> <p>FY 2019 Plans: Continue to build and refine on the initial connectivity established in prior years to include establishing a robust hybrid cloud environment and expanding to access multiple training facilities within one geographic location. Current connections to the CMF</p>		13.683	10.500	10.600

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
sites will be optimized to reduce latency and efficiency on the existing persistent backbone transport bandwidth. This will include providing network nodes at training sites and cyber ranges directly supporting PCTE.				
FY 2020 Plans: 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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase is due to the requirements to extend PCTE capabilities to all available training facilities within the base.				
Title: Government Program Management for Persistent Cyber Training Environment (PCTE)		2.300	-	-
Description: Program management, engineering and technical oversight, contract support and travel for the PCTE program.				
Title: Persistent Cyber Training Environment (PCTE) Test and Evaluation		1.682	5.517	2.502
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.				
FY 2019 Plans: Continue to complete multi-levels of evaluation and testing on individual products, integrated capabilities, and capability drops. This includes integration testing, field evaluations, and operational testing. Execute formal validation and verifications events prior to release of capability drops assuring capabilities perform as expected.				
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 2019 to FY 2020 Increase/Decrease Statement: The reduction in funding is due to anticipated learning curve efficiencies.				
Title: FY 2018 Congressional Rescission		5.676	-	-
Description: FY 2018 Congressional Rescission				
Accomplishments/Planned Programs Subtotals		56.071	52.817	52.102

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>			<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• B65010: <i>Persistent Cyber Training Environment</i>	4.000	3.000	3.000	-	3.000	3.000	3.000	3.000	3.030	0.000	22.030

Remarks

B65010-OPA2

D. Acquisition Strategy

The Persistent Cyber Training Environment (PCTE) program will employ an incremental acquisition strategy. The strategy leverages the use of existing cyber contract and Other Transaction Authority (OTA) vehicles to provide specified capabilities that will be integrated into a cohesive training platform. PCTE will provide iterative capability in prototypes provided to the Cyber Mission Forces (CMF) in drops that either improve or add features. These capability drops will be based on requirements contained and further developed as part of the PCTE Information System Capability Development Document (IS CDD).

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Program Management	TBD	Various : Various	-	2.300		-		-		-		-	Continuing	Continuing	Continuing
Subtotal			-	2.300		-		-		-		-	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PCTE Development and Integration	Option/CPFF	Various : Various	29.336	52.088	May 2018	47.300	Feb 2019	49.602	Feb 2020	-		49.602	Continuing	Continuing	Continuing
Subtotal			29.336	52.088		47.300		49.602		-		49.602	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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PCTE Government Test and Evaluation	Various	Various : Various	-	1.683	Mar 2018	5.517	Mar 2019	2.500	Mar 2020	-		2.500	Continuing	Continuing	Continuing
Subtotal			-	1.683		5.517		2.500		-		2.500	Continuing	Continuing	N/A

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		29.336	56.071	52.817	52.102	52.102	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Event Management	[Redacted]																											
Event Management	[Redacted]																											
Environment	[Redacted]																											
Environment	[Redacted]																											
Connectivity	[Redacted]																											
Connectivity	[Redacted]																											
Training Sites	[Redacted]																											
Training Sites	[Redacted]																											
Test and Evaluation	[Redacted]																											
Test and Evaluation	[Redacted]																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0305251A / <i>Cyberspace Operations Forces and Force Support</i>	Project (Number/Name) FA8 / <i>Cyberspace Operations Forces and Force Support</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Event Management	1	2017	4	2024
Environment	1	2017	4	2024
Connectivity	1	2017	4	2024
Training Sites	1	2017	4	2024
Test and Evaluation	2	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1206120A / Assured Positioning, Navigation and Timing (PNT)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	128.640	192.562	-	192.562	221.875	118.051	46.720	10.918	Continuing	Continuing
FJ8: Assured Positioning, Navigation and Timing (PNT)	-	0.000	58.985	42.379	-	42.379	38.130	25.180	0.000	0.000	0.000	164.674
FJ9: Dismounted A-PNT	-	0.000	15.969	32.360	-	32.360	13.350	0.000	0.000	0.000	0.000	61.679
FK1: Pseudolites	-	0.000	20.776	42.452	-	42.452	79.379	24.649	0.000	0.000	0.000	167.256
FK2: Mounted A-PNT	-	0.000	22.788	66.471	-	66.471	82.965	61.969	44.020	10.918	Continuing	Continuing
FK3: Anti-Jam Antenna	-	0.000	10.122	8.900	-	8.900	8.051	6.253	2.700	0.000	0.000	36.026

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

Assured Positioning, Navigation and Timing (A-PNT) will provide the Army's ground maneuver forces access to trusted PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied. Joint Requirements Oversight Council Memo (JROCM) 049-10, dated 05 Apr 2010, approved the Positioning, Navigation and Timing Assurance Initial Capabilities Document and designated the Army as the Lead Component for Assured PNT. The Material Development Decision (MDD) was approved on 30 Jul 2013. The Assured PNT draft Capabilities Development Document was validated by the Army Requirements Oversight Council (AROC) on 28 Jul 2014. The Assured PNT Cross Functional Team is drafting individual requirements for each product. The Mounted A-PNT System (MAPS) Directed Requirement was approved 13 Jan 2019.

Positioning, Navigation and Timing (PNT) is a critical enabler of many Army systems. The current Global Positioning System (GPS) capability is a fixed frequency system vulnerable to current and emerging threats, and field conditions (e.g. urban, dense vegetation), which means Warfighter assured access to and integrity of the PNT signal is not guaranteed. This situation degrades mission performance to an unacceptable level. Therefore, current Army systems cannot operate in an electronically contested or degraded environment at the required PNT Assurance Levels with GPS alone.

A-PNT consists of five projects; (FJ8) Assured PNT, (FJ9) Dismounted A-PNT System (DAPS), (FK1) Pseudolite, (FK2) Mounted A-PNT System (MAPS), and (FK3) Anti-Jam Antenna System (AJAS). These A-PNT projects support access to and integrity of PNT information. Project Manager (PM) PNT manages these five project (Assured PNT, DAPS, Pseudolite, MAPS, and AJAS) constructed to investigate, prototype, experiment, model, asses, develop, test, modify, field, and sustain A-PNT solutions.

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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	
<p>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.</p> <p>(FJ9) - The Dismounted A-PNT System (DAPS) provides assured PNT data to Soldier borne equipment (e.g. Nett Warrior, and other Soldier architecture compliant systems). DAPS is a Size, Weight, and Power, optimized military GPS, fused with other sensors.</p> <p>(FK1) - The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.</p> <p>(FK2) - The Mounted A-PNT System (MAPS) provides assured PNT data under conditions where space-based PNT (e.g. GPS) may be limited or denied by fusing non-RF sensors with GPS. It distributes assured PNT data to tactical command, communication and control systems on Army tactical and combat vehicles.</p> <p>(FK3) - The Anti-Jam Antenna System (AJAS) provides protection against jamming threats. The AJAS is tightly coupled with the MAPS to provide GPS signal protection and assured PNT in challenged environments on Army tactical and combat vehicles.</p> <p>FY 2020 Base funds in the total amount of \$192.562 million are provided to continue the development of the Assured PNT program. The FJ8 funding line accounts for \$42.379 million for PNT System of Systems Architecture (SOSA) Testing, Resiliency and Software Assurance Modification (RSAM), ALT NAV Enterprise Build-out and continued development of Assured PNT Enterprise Enablers. The FJ9 funding line accounts for \$32.360 million to continue prototype development and testing for the DAPS. The FK1 funding line accounts for \$42.452 million to continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 (\$18.139 million) and FK2 (\$24.313) million. The FK2 funding line accounts for \$66.471 million to continue integration, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems. The FK3 funding line accounts for \$8.900 million to continue integration, training and Soldier Assessment of AJAS, fielded with MAPS on selected combat vehicles and command, control, and communication systems.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	146.300	80.864	-	80.864
Current President's Budget	0.000	128.640	192.562	-	192.562
Total Adjustments	0.000	-17.660	111.698	-	111.698
• Congressional General Reductions	-	-0.160			
• Congressional Directed Reductions	-	-17.500			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	111.698	-	111.698

Change Summary Explanation

The \$111.698 million increase is primarily driven in support of the implementation of the Army's Network modernization priority. The program plans on executing and accelerating the building and delivery of Dismounted Assured Positioning, Navigation and Timing System and Mounted Assured Positioning, Navigation and Timing System prototypes, conduct laboratory testing, and conduct a series of tests and assessments.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FJ8: Assured Positioning, Navigation and Timing (PNT)	-	0.000	58.985	42.379	-	42.379	38.130	25.180	0.000	0.000	0.000	164.674
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Assured PNT project line is comprised of: 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 Alternative PNT & Area Protection technologies that include Enterprise Enablers such as the Alternative Navigation (ALT NAV) signal Enterprise Build-out.

The Alternative PNT & Area Protection technologies will be developed in order to demonstrate ALT NAV, emerging situational awareness capabilities and net-enabled GPS solutions to provide Radio Frequency (RF) and non-RF threat mitigation. 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.

FY 2020 base funds in the amount of \$42.379 million are to support PNT System of Systems Architecture (SoSA) Testing, enhancements to Army PNT receivers and capabilities, prototype development, and support for Enterprise Enabler development. RSAM will support continued software development against emerging threats for DAGR, GB-GRAM and MicroGRAM. The PNT SoSA Testing will allow for Army systems to test developed RSAM software and enable actions to be taken to ensure full operational capability of Army Forces through RSAM fielded software. In addition, FY2020 Base funds under PE 1206120A (project FK1) in the amount of \$18.139 million are to be realigned to support to Army's Modernization Enterprise Enabler priorities.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: PNT System of System (SOSA) Testing and Resiliency and Software Assurance Measures (RSAM)	-	37.834	21.992	-	21.992
Description: The effort supports SOSA testing, RSAM and other Army PNT capabilities.					
FY 2019 Plans: FY 2019 base funds support testing and RSAM software development for Ground Based GPS Receiver Applications Module (GB-GRAM).					
PNT SOSA testing and RSAM will complete software development Update 1 for Defense Advanced GPS Receiver (DAGR) and continue software development for GB-GRAM/MicroGRAM, to include engineering build					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>testing, formal qualification testing, and risk mitigation efforts for platforms utilizing DAGR and GB-GRAM. In addition, DAGR RSAM integration testing efforts will be performed in associated with relevant platforms.</p> <p>Each Army Modernization Priority has PNT dependencies. As a modernization enabler, PNT is essential to future readiness. PM PNT will address current and future development gaps in readiness within Army Modernization Priority systems. PNT gaps will be addressed to improve readiness of Army Priority Systems in a GPS challenged environment. This includes RSAM upgrades to NavStrike 3.3 software to improve performance of Long Range Precision Fires (LRPF) as the top Army Modernization Priority.</p> <p>FY 2020 Base 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).</p> <p>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 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: SOSA Testing and RSAM decreased from \$37.834M in FY 2019 to \$21.992M in FY 2020 due to reduced integration requirements in FY 2020.</p>					
<p>Title: Assured Positioning, Navigation and Timing (PNT) Enterprise Enablers</p> <p>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.</p> <p>FY 2019 Plans: FY2019 Base funds will provide an Enterprise Build-out that enables Alternative Navigation (ALT NAV) capabilities which provide positioning, navigation and timing data in a denied or degraded environment.</p>	-	21.151	20.387	-	20.387

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Activities to support this effort include: network integration, installation and testing of the assured timing/location modular enterprise capability for ALT NAV.					
<i>FY 2020 Base Plans:</i> 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.					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Assured PNT Enterprise Enablers slightly decreased by \$0.764 million, funding remains stable.					
Accomplishments/Planned Programs Subtotals	-	58.985	42.379	-	42.379

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• K49010: Mounted/ Dismounted Receivers	-	-	1.980	-	1.980	3.047	3.495	7.082	2.373	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.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FJ8 / <i>Assured Positioning, Navigation and Timing (PNT)</i>
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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.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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)
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support	Allot	PM PNT : Various	-	-		3.549	Jan 2019	2.506	Jan 2020	-		2.506	Continuing	Continuing	-
Subtotal			-	-		3.549		2.506		-		2.506	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
RSAM - DAGR Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	-	-		0.590	Mar 2019	4.902	Dec 2019	-		4.902	Continuing	Continuing	-
RSAM - G-GRAM Software Development	SS/CPIF	GCC Technologies : Oakland, MD	-	-		5.114	Jun 2019	2.276	Feb 2020	-		2.276	Continuing	Continuing	-
Assured PNT Enterprise Enablers	C/FFP	Various : Various	-	-		-		20.387	Dec 2019	-		20.387	Continuing	Continuing	-
Assured PNT Enterprise Buildout	MIPR	Various : Various	-	-		19.018	Feb 2019	-		-		-	0.000	19.018	-
Army Modernization Priorities	MIPR	Various : Various	-	-		2.321	Feb 2019	-		-		-	0.000	2.321	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		2.162		-		-		-	0.000	2.162	-
Subtotal			-	-		29.205		27.565		-		27.565	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Contracting Services	C/FFP	DCS Corp : APG, MD	-	-		2.892	Jan 2019	2.978	Jan 2020	-		2.978	Continuing	Continuing	-
Engineering and Technical Government Services	MIPR	C4ISR : Various	-	-		0.222	Jan 2019	0.225	Jan 2020	-		0.225	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 1206120A / Assured Positioning, Navigation and Timing (PNT)				FJ8 / Assured Positioning, Navigation and Timing (PNT)							
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Assured PNT Enterprise Enablers Contractor Engineering Support	Various	DCS Corporation : APG, MD	-	-		0.328	Feb 2019	-		-		-	0.000	0.328	-
Subtotal			-	-		3.442		3.203		-		3.203	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
SOSA Testing/RSAM - Government Eng Support	MIPR	Various : Various	-	-		1.031	Jan 2019	2.669	Jan 2020	-		2.669	Continuing	Continuing	-
SOSA Testing/RSAM - Contractor Eng Support	C/CPFF	Various : Various	-	-		1.521	Jan 2019	1.864	Jan 2020	-		1.864	Continuing	Continuing	-
Platform Integration Testing	C/Various	Various : Various	-	-		18.874	Mar 2019	4.279	Mar 2020	-		4.279	Continuing	Continuing	-
SOSA Testing/RSAM Test Equipment	C/Various	Various : Various	-	-		0.336	Jun 2019	0.293	Jun 2020	-		0.293	Continuing	Continuing	-
Assured PNT Enterprise Buildout Test Support	C/Various	Various : Various	-	-		1.027	Feb 2019	-		-		-	0.000	1.027	-
Subtotal			-	-		22.789		9.105		-		9.105	Continuing	Continuing	N/A
Project Cost Totals			-	-		58.985		42.379		-		42.379	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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)

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
PNT System of Systems Architecture (SOSA) Testing					SOSA Testing																							
RSAM - DAGR Software Development and Testing					DAGR Software Development and Testing																							
RSAM DAGR Update 1 Software Release					DAGR Update 1																							
RSAM DAGR Update 2 Software Release					DAGR Update 2																							
RSAM - GB-GRAM/MicroGRAM Software Development and Testing					GB-GRAM/MicroGRAM Software Development and Testing																							
RSAM GB-GRAM Update 1 Software Release					GB-GRAM Update 1																							
RSAM MicroGRAM Update 1 Software Release					MicroGRAM Update 1																							
RSAM GB-GRAM Update 2 Software Release					GB-GRAM/MicroGRAM Update 2																							
Platform Integration Testing					Platform Integration Testing																							
Army Enterprise Enablers					Army Enterprise Enablers																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FJ8 / <i>Assured Positioning, Navigation and Timing (PNT)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
PNT System of Sytems Architecture (SOSA) Testing	1	2019	4	2022
RSAM - DAGR Software Development and Testing	1	2019	4	2022
RSAM DAGR Update 1 Software Release	3	2020	3	2020
RSAM DAGR Update 2 Software Release	2	2023	2	2023
RSAM - GB-GRAM/MicroGRAM Software Development and Testing	1	2019	4	2022
RSAM GB-GRAM Update 1 Software Release	3	2020	3	2020
RSAM MicroGRAM Update 1 Software Release	1	2021	1	2021
RSAM GB-GRAM Update 2 Software Release	2	2023	2	2023
Platform Integration Testing	1	2019	4	2022
Army Enterprise Enablers	1	2019	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>				Project (Number/Name) FJ9 / <i>Dismounted A-PNT</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FJ9: <i>Dismounted A-PNT</i>	-	0.000	15.969	32.360	-	32.360	13.350	0.000	0.000	0.000	0.000	61.679
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Dismounted Assured PNT (A-PNT) System (DAPS) acquires, protects, and distributes secure PNT to the Dismounted Soldier. DAPS will be used in conjunction with the PEO Soldier Nett Warrior System Ensemble (e.g., Nett Warrior and other Soldier architecture compliant systems). 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 includes receiver software capable of acquiring alternative PNT signals resulting in additional integrity for military GPS in denied environments and includes a Selective, Availability, Anti-Spoof module (SAASM) and or Military-Code (M-Code) receiver solution with other future technologies.

FY 2020 Base funds in the amount of \$32.360 million are provided to deliver DAPS prototypes, conduct product verification testing as well as a series of testing events to include performance and reliability. In parallel to these activities, ongoing integration with the Nett Warrior End User Device will occur.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Dismounted A-PNT System (DAPS)	-	15.969	32.360	-	32.360
Description: This effort supports the development and delivery of DAPS prototypes for integration, evaluation and performance testing.					
FY 2019 Plans: FY2019 Base funds will support hardware and software prototype evaluations to include design reviews, test planning and Nett Warrior hardware and software integration. In addition, the funding will also support the development of the Dismounted system with the size, weight, and power optimized for a multi-sensor navigation prototype. Begin Integration of the Integrated Visual Augmentation System (IVAS) and Heads Up Display (HUD) 3.0 architecture.					
FY 2020 Base Plans: FY20 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 FY21. Other efforts include: requirement/design trade					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FJ9 / <i>Dismounted A-PNT</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 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.					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increase of \$16.391 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.					
Accomplishments/Planned Programs Subtotals	-	15.969	32.360	-	32.360

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• K49020: <i>Dismounted Hub</i>	-	-	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing

Remarks
K49020 / Dismounted Hub is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy
The goal of the Dismounted A-PNT program is to provide the Soldier conducting operations outside of vehicles unhindered access to trusted PNT under conditions where space based PNT may be limited or denied, as well as a means to maintain accurate position, velocity, and time information in Global Positioning System (GPS) challenged or degraded/denied environments. The Dismounted A-PNT capability will provide improved performance and reliability, availability, and maintainability 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 competitive Other Transaction Authority (OTA)'s to 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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.107	Dec 2018	1.530	Dec 2019	-		1.530	Continuing	Continuing	-
Subtotal			-	-		1.107		1.530		-		1.530	Continuing	Continuing	N/A

Remarks
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Dismounted A-PNT Prototyping & Development Vendor 1	C/FFP	TBD : TBD	-	-		4.906	Feb 2019	2.326	Nov 2019	-		2.326	0.000	7.232	-
Dismounted A-PNT Prototyping & Development Vendor 2	C/FFP	TBD : TBD	-	-		2.906	Feb 2019	1.324	Nov 2019	-		1.324	0.000	4.230	-
Dismounted A-PNT Prototyping & Delivery	C/FFP	TBD : TBD	-	-		-		7.058	Feb 2020	-		7.058	Continuing	Continuing	-
Development of a Dismounted M-Code capable prototype	MIPR	TBD : TBD	-	-		1.800	Jun 2019	4.460	Feb 2020	-		4.460	Continuing	Continuing	-
Development of a small SWAP-C multi sensor navigation prototype	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	-		0.896	Dec 2018	-		-		-	0.000	0.896	-
Engineering and Technical Product Development	MIPR	C5ISR : Various	-	-		0.293	Dec 2018	3.377	Dec 2019	-		3.377	Continuing	Continuing	-
Nett Warrior Integration	MIPR	TBD : TBD	-	-		0.846	Feb 2019	1.698	Feb 2020	-		1.698	Continuing	Continuing	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.584		-		-		-	0.000	0.584	-
Subtotal			-	-		12.231		20.243		-		20.243	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 1206120A / Assured Positioning, Navigation and Timing (PNT)				FJ9 / Dismounted A-PNT							
Support (\$ in Millions)															
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	Various	C5ISR : Various	-	-		0.702	Nov 2018	0.856	Nov 2019	-		0.856	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		0.796	Jan 2019	0.924	Nov 2019	-		0.924	Continuing	Continuing	-
Subtotal			-	-		1.498		1.780		-		1.780	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)															
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test Support	C/Various	Various : Various	-	-		1.133	Dec 2018	8.807	Dec 2019	-		8.807	Continuing	Continuing	-
Subtotal			-	-		1.133		8.807		-		8.807	Continuing	Continuing	N/A
Project Cost Totals			-	-		15.969		32.360		-		32.360	Continuing	Continuing	N/A
<u>Remarks</u>															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Dismounted A-PNT M-Code / SWAP-C Prototypes					M-Code / SWAP-C Prototypes																							
Dismounted A-PNT Prototype Acquisition Decision					1				Prototype Acquisition Decision																			
Dismounted A-PNT Prototyping & Delivery									Prototyping & Delivery																			
Dismounted A-PNT Prototype Testing													Prototype Testing															
Dismounted A-PNT Nett Warrior Integration									Nett Warrior Integration																			
Dismounted A-PNT Production Decision Milestone																	2				Production Decision Milestone							
Dismounted A-PNT Production																	Production											
Dismounted A-PNT Fielding																					Fielding							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FJ9 / <i>Dismounted A-PNT</i>

Schedule Details

Events	Start		End	
	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	1	2021
Dismounted A-PNT Nett Warrior Integration	2	2019	1	2021
Dismounted A-PNT Production Decision Milestone	2	2021	2	2021
Dismounted A-PNT Production	3	2021	4	2022
Dismounted A-PNT Fielding	1	2022	2	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>				Project (Number/Name) FK1 / <i>Pseudolites</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FK1: <i>Pseudolites</i>	-	0.000	20.776	42.452	-	42.452	79.379	24.649	0.000	0.000	0.000	167.256
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.

FY 2020 Base funds in the amount of \$42.452 million will continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 (\$18.139 million) and FK2 (\$24.313 million).

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Alternative PNT & Area Protection	-	20.776	42.452	-	42.452
Description: Pseudolites transitioning to Alternative PNT & Area Protection					
FY 2019 Plans: FY 2019 Base funds will complete smart shutdown of the Pseudolite program and refocus a material solution approach for requirements associated with Alternative PNT & Area Protection. A new project line is requested to support this transition.					
FY 2020 Base Plans: FY2020 Base funds will continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 (\$18.139 million) and FK2 (\$24.313 million).					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK1 / <i>Pseudolites</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase in the amount of \$21.676 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.					
Accomplishments/Planned Programs Subtotals	-	20.776	42.452	-	42.452

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• K49050: <i>Pseudolite Capability A-PNT</i>	-	-	2.000	5.439	7.439	8.558	2.000	1.912	1.945	Continuing	Continuing

Remarks
K49050 / Pseudolite Capability A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.

The Project Manager, Positioning, Navigation and Timing (PM PNT) will complete smart shutdown of the Pseudolite program and refocus a material solution approach for requirements associated with Alternative PNT & Area Protection.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK1 / <i>Pseudolites</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.428	Dec 2018	-		-		-	0.000	1.428	-
Subtotal			-	-		1.428		-		-		-	0.000	1.428	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Product Support	MIPR	C5ISR : Various	-	-		1.804	Nov 2018	-		-		-	0.000	1.804	-
Alternative PNT & Area Protection Command & Control (C2)	C/Various	Various : Various	-	-		1.350	Jan 2019	-		-		-	0.000	1.350	-
Situational Awareness Development	C/Various	Various : Various	-	-		2.250	Feb 2019	-		-		-	0.000	2.250	-
Spectrum Modification for PNT Solutions (ALT PNT Banding)	C/Various	Various : Various	-	-		1.522	Feb 2019	-		-		-	0.000	1.522	-
RF Signals of Opportunity for PNT	C/Various	Various : Various	-	-		0.878	Feb 2019	-		-		-	0.000	0.878	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.263		-		-		-	0.000	1.263	-
Realignment to FK2 Client and Platform Integration	C/Various	Variuos : Variuos	-	-		-		24.313	Nov 2019	-		24.313	Continuing	Continuing	-
Realignment to FJ8 Alternative Navigation	C/Various	Variuos : Variuos	-	-		-		6.720	Dec 2019	-		6.720	Continuing	Continuing	-
Realignment to FJ8 Navigation Warfare (NAVWAR) & GPS	C/Various	Variuos : Variuos	-	-		-		3.373	Dec 2019	-		3.373	Continuing	Continuing	-
Realignment to FJ8 Alternative PNT Modeling & Simulation	C/Various	Variuos : Variuos	-	-		-		3.846	Dec 2019	-		3.846	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / Assured Positioning, Navigation and Timing (PNT)	Project (Number/Name) FK1 / Pseudolites
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		9.067		38.252		-		38.252	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	-		1.299	Nov 2018	-		-		-	0.000	1.299	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		2.989	Jan 2019	-		-		-	0.000	2.989	-
Subtotal			-	-		4.288		-		-		-	0.000	4.288	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Alternative PNT & Area Protection Demonstration / Planning	MIPR	Various : Various	-	-		5.993	Mar 2019	-		-		-	0.000	5.993	-
Realignment to FJ8 Testing of Alternative PNT Technologies	C/Various	Variuos : Variuos	-	-		-		4.200	Feb 2020	-		4.200	Continuing	Continuing	-
Subtotal			-	-		5.993		4.200		-		4.200	Continuing	Continuing	N/A

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	20.776	42.452	-	42.452	Continuing	Continuing	N/A

Remarks
The Mounted Client and Platform Integration is required for 81 Platforms and 27 Client PMs.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>		Project (Number/Name) FK1 / <i>Pseudolites</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Pseudolite (PL) Prototype Smart Shutdown and Transition					Smart Shutdown & Transition																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK1 / <i>Pseudolites</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Pseudolite (PL) Prototype Smart Shutdown and Transition	1	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>				Project (Number/Name) FK2 / <i>Mounted A-PNT</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FK2: <i>Mounted A-PNT</i>	-	0.000	22.788	66.471	-	66.471	82.965	61.969	44.020	10.918	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Mounted Assured Positioning, Navigation, and Timing (PNT) System (MAPS) provides assured PNT data, is a key enabler, and a cross cutting capability for Army ground maneuver forces to execute their mission in support of the Network Enabling Function. Army ground maneuver Forces require access to assured PNT under conditions where space-based PNT (e.g. Global Positioning System (GPS)) may be limited or denied by fusing non-Radio Frequency (RF) sensors with GPS. It distributes assured PNT data to tactical command, communication and control systems on Army tactical and combat vehicles. The current GPS capability is a fixed frequency system which is vulnerable to current and emerging threats and field condition.

The MAPS is a scalable, upgradable system mounted on Army ground force platforms. It fuses GPS with complimentary navigation and timing technologies to provide assured PNT to client systems and platforms. The MAPS distributes PNT data to multiple systems directly and via the network, reducing the dependency on multiple GPS receiver devices on a single platform. In order to achieve performance requirements in the highest threat level conditions, an Anti-Jam Antenna will be integrated with the MAPS. 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.

FY 2020 Base funds, in the amount of \$66.471 million, are provided for integration, installation, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems. Integration activities are required for 81 unique platforms and 27 client systems based on the current basis of issue (BOI). In addition, FY2020 Base funds under PE 1206120A (project FK1) in the amount of \$24.313 million are to be realigned to support MAPS acceleration and to align MAPS to Army Modernization priorities.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Mounted A-PNT System (MAPS)	-	22.788	66.471	-	66.471
Description: This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment.					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK2 / <i>Mounted A-PNT</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>FY2019 Base funds will complete MAPS prototyping and early client system integration efforts in the systems integration lab. The funds initiate delivery of MAPS prototypes for testing and performance characterization.</p> <p><i>FY 2020 Base Plans:</i> FY2020 Base funds will support integration, installation, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increase in the amount of \$43.683 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.</p>					
Accomplishments/Planned Programs Subtotals	-	22.788	66.471	-	66.471

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• K49030: <i>Mounted Hub A-PNT</i>	-	-	29.950	6.339	36.289	29.946	56.621	105.364	61.222	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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.446	Dec 2018	2.130	Dec 2019	-		2.130	Continuing	Continuing	-
Subtotal			-	-		1.446		2.130		-		2.130	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Mounted/AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	-		10.509	Jun 2019	-		-		-	0.000	10.509	-
Engineering and Technical Product Development	MIPR	C5ISR : APG, MD	-	-		1.534	Dec 2018	1.086	Dec 2019	-		1.086	Continuing	Continuing	-
Client and Platform Integration	MIPR	PEO CS&CSS : Various	-	-		-		47.425	Nov 2019	-		47.425	Continuing	Continuing	-
Client Software Development (JBCP)	MIPR	AMRDEC/S3I : APG, MD	-	-		0.967	Jan 2019	-		-		-	0.000	0.967	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG, MD	-	-		-		2.997	Dec 2019	-		2.997	0.000	2.997	-
FY2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.835		-		-		-	0.000	0.835	-
Subtotal			-	-		13.845		51.508		-		51.508	Continuing	Continuing	N/A

Remarks
 Client and Platform Integration is required for 81 Platforms and 27 Client PMs.

 On schedule to award the competitive firm fixed price Mounted/AJAS prototype development contract. Expenditures for this contract will align with milestone payments to the vendor as deliverables are completed.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	-		0.187	Dec 2018	1.038	Nov 2019	-		1.038	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	-		2.029	Dec 2018	4.729	Nov 2019	-		4.729	Continuing	Continuing	-
Subtotal			-	-		2.216		5.767		-		5.767	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Performance Testing	MIPR	C5ISR : Various	-	-		1.330	May 2019	2.355	Nov 2019	-		2.355	Continuing	Continuing	-
Reliability Testing	MIPR	C5ISR : Various	-	-		-		1.571	Feb 2020	-		1.571	Continuing	Continuing	-
Field Testing	MIPR	Army Test and Evaluation Command (ATEC) : White Sands Missile Range (WSMR)	-	-		0.551	Feb 2019	-		-		-	0.000	0.551	-
Military Feasibility Assessment (MFA)	MIPR	Various : TBD	-	-		-		2.355	Mar 2020	-		2.355	Continuing	Continuing	-
Systems Engineering and Integration Testing & Support	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	-		3.400	Jan 2019	0.785	Dec 2019	-		0.785	0.000	4.185	-
Subtotal			-	-		5.281		7.066		-		7.066	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
	Project Cost Totals		-	-	22.788	66.471	-	66.471	Continuing	Continuing

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK2 / <i>Mounted A-PNT</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Mounted A-PNT Risk Reduction Activities					Risk Reduction Activities																							
Mounted A-PNT Prototyping and Testing - Phase I									Prototyping and Testing																			
Mounted A-PNT Performance Testing									EMI, ENV & Perf Test																			
Mounted A-PNT Test and Integration - Phase II									Phase II Test and Integration																			
Client and Platform Integration (81 Platforms & 27 Client PMs)									Client and Platform Integration (81 Platforms & 27 Client PMs)																			
Military Feasibility Assessment (MFA)													MFA															
Mounted A-PNT Production Decision																	1 Production Decision											
Production Award																									2 Production Award			
MAPS Technology Insertion Development																									MAPS Technology Insertion Development			

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK2 / <i>Mounted A-PNT</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Mounted A-PNT Risk Reduction Activities	1	2019	1	2022
Mounted A-PNT Prototyping and Testing - Phase I	1	2019	3	2019
Mounted A-PNT Performance Testing	3	2019	2	2020
Mounted A-PNT Test and Integration - Phase II	3	2019	4	2020
Client and Platform Integration (81 Platforms & 27 Client PMs)	3	2019	2	2022
Military Feasibility Assessment (MFA)	2	2020	3	2020
Mounted A-PNT Production Decision	4	2020	4	2020
Production Award	1	2021	1	2021
MAPS Technology Insertion Development	2	2023	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FK3: Anti-Jam Antenna	-	0.000	10.122	8.900	-	8.900	8.051	6.253	2.700	0.000	0.000	36.026
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

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.

FY 2020 Base funds in the amount of \$8.900 million provide integration, installation, training and Soldier assessment of AJAS fielded with MAPS on selected combat vehicles and command, control and communication systems. Integration activities are required for 81 unique platforms and 27 client systems based on the current basis of issue (BOI).

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Anti-Jam Antenna System	-	10.122	8.900	-	8.900
Description: This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment.					
FY 2019 Plans: FY 2019 Base funds will complete AJAS prototyping and client system integration lab (SIL) testing. Funds will initiate delivery of AJAS prototypes to be used for test and characterization, as well as continue the manufacturing and development of the AJAS prototypes.					
FY 2020 Base Plans: FY2020 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 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK3 / <i>Anti-Jam Antenna</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The Anti-Jam Antenna System (AJAS) funding line decreased from \$10.122M in FY 2019 to \$8.900M in FY 2020 due to the incorporation of the Anti-Jam Antenna System (AJAS) into the Mounted Assured Positioning, Navigation and Timing System (MAPS) draft Capabilities Development Document (CDD).					
Accomplishments/Planned Programs Subtotals	-	10.122	8.900	-	8.900

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• K49040: <i>Anti-Jam Antenna A-PNT</i>	-	-	5.144	-	5.144	10.460	23.083	24.486	24.855	Continuing	Continuing

Remarks
K49040 / Anti-Jam Antenna A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing

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.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		0.710	Oct 2018	0.285	Dec 2019	-		0.285	0.000	0.995	-
Subtotal			-	-		0.710		0.285		-		0.285	0.000	0.995	N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Development of the Systems Engineering and Integration Lab	MIPR	CERDEC Command Power and Integration Lab : APG, MD	-	-		-		0.276	Dec 2019	-		0.276	0.000	0.276	-
Platform Integration	MIPR	PEO CS&CSS : Warren, MI	-	-		2.058	Dec 2018	-		-		-	Continuing	Continuing	-
Engineering and Technical Product Development	MIPR	C5ISR : APG,MD	-	-		0.200	Dec 2018	-		-		-	Continuing	Continuing	-
Mounted and AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	-		4.098	Jun 2019	-		-		-	Continuing	Continuing	-
Client Software Development (JBCP)	MIPR	AMERDEC/S3I Directorate : APG,MD	-	-		-		3.331	Nov 2019	-		3.331	Continuing	Continuing	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG,MD	-	-		-		2.993	Dec 2019	-		2.993	0.000	2.993	-
FY2019 SBIR /STTR Transfer	TBD	TBD : TBD	-	-		0.371		-		-		-	0.000	0.371	-
Subtotal			-	-		6.727		6.600		-		6.600	Continuing	Continuing	N/A

Remarks
 Platform Integration is required for 81 Platforms and 27 Client PMs.

 On schedule to award the competitive firm fixed price Mounted/AJAS prototype development contract. Expenditures for this contract will align with milestone payments to the vendor as deliverables are completed.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering and Technical Services - Government	MIPR	C5ISR : Various	-	-		0.130	Oct 2018	0.130	Nov 2019	-		0.130	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	-		1.612	Oct 2018	1.885	Nov 2019	-		1.885	0.000	3.497	-
Subtotal			-	-		1.742		2.015		-		2.015	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Live Sky Demo and Antenna Anechoic Chamber Test	MIPR	CERDEC - Command Power and Integration Directorate : APG, MD	-	-		0.478	May 2019	-		-		-	Continuing	Continuing	-
Anti-Jam Antenna Integrity/ Performance Testing	MIPR	CERDEC STCD : APG,MD	-	-		0.337	May 2019	-		-		-	0.000	0.337	-
TNT Prototype testing	MIPR	CERDEC STCD : APG, MD	-	-		0.128	May 2019	-		-		-	0.000	0.128	-
Subtotal			-	-		0.943		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	10.122	8.900	-	8.900	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK3 / <i>Anti-Jam Antenna</i>

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Anti-Jam Antenna Risk Reduction Activities																												
Anti-Jam Antenna Prototyping and Testing - Phase I																												
Chamber Testing																												
TNT Prototype Testing																												
Integrity/Performance Testing																												
Performance Testing																												
Anti-Jam Antenna Test and Integration - Phase II																												
Client and Platform Integration (81 Platforms and 27 Client PMs)																												
Military Feasibility Assessment (MFA)																												
Anti-Jam Antenna Production Decision																												
Production Award																												
MAPS Technology Insertion Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / <i>Assured Positioning, Navigation and Timing (PNT)</i>	Project (Number/Name) FK3 / <i>Anti-Jam Antenna</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Anti-Jam Antenna Risk Reduction Activities	1	2019	1	2022
Anti-Jam Antenna Prototyping and Testing - Phase I	1	2019	3	2019
Chamber Testing	3	2019	4	2019
TNT Prototype Testing	3	2019	4	2019
Integrity/Performance Testing	3	2019	4	2019
Performance Testing	3	2019	2	2020
Anti-Jam Antenna Test and Integration - Phase II	3	2019	4	2020
Client and Platform Integration (81 Platforms and 27 Client PMs)	3	2019	2	2022
Military Feasibility Assessment (MFA)	2	2020	3	2020
Anti-Jam Antenna Production Decision	4	2020	4	2020
Production Award	1	2021	1	2021
MAPS Technology Insertion Development	2	2023	4	2025

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	30.121	38.307	104.996	-	104.996	23.168	18.653	17.373	18.396	Continuing	Continuing
FE5: Space And Missile Defense Integration	-	15.655	17.213	104.996	-	104.996	23.168	18.653	17.373	18.396	Continuing	Continuing
FE6: Army Space System Enhancement/Integration	-	14.466	21.094	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.560

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).

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 (COCOMs), Joint Task Forces (JTFs), and Coalition Partners. The MMC injects real-time J-FFT information into the COP for COCOMs, 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	20.432	38.319	22.277	-	22.277
Current President's Budget	30.121	38.307	104.996	-	104.996
Total Adjustments	9.689	-0.012	82.719	-	82.719
• Congressional General Reductions	-0.006	-0.012			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	10.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.305	-			
• Adjustments to Budget Years	-	-	82.719	-	82.719

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206308A / <i>Army Space Systems Integration</i>	

Change Summary Explanation

FY 2020 funding increase supports the Low Earth Orbit strategy as well as efforts to address Narrowband Consolidated SATCOM System Expert (C-SSE) enterprise level capability to monitor, detect, and assess UHF SATCOM interference.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FE5: Space And Missile Defense Integration	-	15.655	17.213	104.996	-	104.996	23.168	18.653	17.373	18.396	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 continue 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.

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

	FY 2018	FY 2019	FY 2020
Title: Architecture Development, Wargames and Demonstrations	12.705	10.440	9.535

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206308A / <i>Army Space Systems Integration</i>	Project (Number/Name) FE5 / <i>Space And Missile Defense Integration</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans: 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 (ICD) or Capability Development Documents (CDD), and Capability Production Documents (CPD) to update system Operational Requirements Documents (ORD). Develop a space superiority Capability Production Document (CPD) and continue to develop the JCIDS documentation required to Integrate space and high altitude capabilities into Multi-Domain Task Force (MDTF).</p> <p>FY 2020 Plans: Expand upon FY19 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</p>				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
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 FY2020.				
FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 to FY2020 decrease attributed to economic factors and to support the Army's modernization priorities in support of the National Defense Strategy.				
Title: Joint Friendly Force Tracking (J-FFT) Testbed		2.950	2.526	2.225
Description: Funding is provided for integration of the Joint Friendly Force Tracking (J-FFT) into Combat Commanders' friendly force tracking requirements, developing the J-FFT Testbed, leveraging network enabled command and control system enhancements, and continuing to support development of FFT capabilities for deployed and coalition forces..				
FY 2019 Plans: Support the full integration of Joint Friendly Force Tracking (J-FFT) into Combat Commanders' friendly force tracking requirements. Continue to develop the J-FFT Testbed for its use in integrating hardware and software prior to its deployment to the field. Leverage network enabled command and control system enhancements and continue to support development of Friendly Force Tracking (FFT) capabilities for deployed and coalition forces. Continue to transition Force Tracking Advanced Management System (FTAMS) to FFT-Mission Management Center (MMC). The J-FFT Division coordinates and executes USSTRATCOM-directed FFT tasks in order to assure continuous 24/7 FFT data services support to authorized users to include the Combatant Commands, the Services, agencies, allies, and coalition partners in order to improve their situational awareness (SA), enhance command and control (C2) to reduce fratricide in combat, homeland defense, civil and contingency operations. Gain Army approval of a Joint Capabilities Integration and Development System (JCIDS) document for JFFT.				
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 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				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
and other coalition assessments and exercises that advance US and coalition FFT interoperability. USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY2020.				
FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 to FY2020 decrease attributed to economic factors and to support the Army's modernization priorities in support of the National Defense Strategy.				
Title: Organizational Development as Part of the SRC40 Proponecy Mission		-	1.450	1.050
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 2019 Plans: Participate in the Force Design Update (FDU) process. FWC 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 (O&O) Concept Papers, Organization Design Papers, Cost Benefit Analyses, Unit Reference Sheets (URS), and Manpower Requirements Criteria (MARC) determination. Participate in the Total Army Analysis (TAA), the Army's annual process to examine the projected Army force qualitatively and quantitatively. SMDC/ARSTRAT will support TAA Rule of Allocation (ROA) development, Capability Demand Analysis (CDA) and Resourcing phases to ensure SRC40 units are properly accounted for in the future POM force. This is performed to analyze the projected Army Force against future demands and levels of funding/authorizations to build the POM Force. SMDC/ARSTRAT FWC will review the SMDC Troops, Organization and Equipment (TOE) requirements documents conducted as part of a cyclic process as well as when needed during other Force Design processes (i.e., Basis of Issue Plan (BOIP) Modernization Path (MODPATH) reviews, Notification of Change (NOFC) reviews, SSN-LIN Automated Management and Integrating System (SLAMIS) reviews, etc.). Participate in BOIP Development, which is a collection of processes including the cyclic review of Army-wide BOIPs under development, development of Feeder Data for SMDC proponent item BOIPs, and validation of BOIP MODPATHs to SMDC TOEs. Complete the Space Forces Force Structure Review (FSR) which is a CBA-like structured three-phased process consisting of a Needs Analysis (NA), Gap Analysis (GA), and Solutions Analysis (SA) 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.				
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) Future Warfare Center (FWC) 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,				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
<p>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 FWC 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 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 FY2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 to FY2020 decrease attributed to economic factors and to support the Army's modernization priorities in support of the National Defense Strategy.</p>				
<p>Title: Position, Navigation, and Timing Navigation Warfare (PNT/NAVWAR)</p> <p>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. Supporting 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. USASMDC/ARSTRAT Future Warfare Center will execute these funds in FY2020.</p> <p>FY 2019 Plans: Identify and advocate 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.</p> <p>FY 2020 Plans:</p>		-	2.410	1.810

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
<p>Based on the results of our efforts in 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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 to FY2020 decrease attributed to economic factors and to support the Army's modernization priorities in support of the National Defense Strategy.</p>				
<p>Title: Narrowband C-SSE enterprise level capability to monitor, detect, and assess UHF SATCOM interference</p> <p>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.</p> <p>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, 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 FY2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY2019 to FY 2020 is the result of the Narrowband C-SSE SATCOM requirement</p>		-	-	11.600
<p>Title: Low Earth Orbit Strategy</p> <p>Description: New Classified effort Low Earth Orbit.</p> <p>FY 2020 Plans: Low Earth Orbit Strategy</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: New effort Low Earth Orbit.</p>		-	-	78.776
<p>Title: FY2019 SBIR/STTR Transfer</p>		-	0.387	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
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 2018	FY 2019	FY 2020
Description: FY2019 SBIR/STTR adjustment.				
FY 2019 Plans: FY2019 SBIR/STTR Transfer				
FY 2019 to FY 2020 Increase/Decrease Statement: N/A				
Accomplishments/Planned Programs Subtotals		15.655	17.213	104.996
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				
E. Performance Metrics				
N/A				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army **Date:** March 2019

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
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Government Personnel and operations support.	TBD	SMDC/ARSTRAT Huntsville, AL and Colorado Springs : SMDC/ARSTRAT Huntsville, AL and Colorado Springs	-	-		16.826		7.726		-		7.726	0.000	24.552	-
FY2019 SBIR/STTR Transfer	TBD	TBD : TBD	-	-		0.387		-		-		-	0.000	0.387	-
Subtotal			-	-		17.213		7.726		-		7.726	0.000	24.939	N/A

Remarks
N/A

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
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		-		18.494		-		18.494	0.000	34.149	-
Low Earth Orbit	TBD	TBD : TBD	-	-		-		78.776		-		78.776	0.000	78.776	-
Subtotal			-	15.655		-		97.270		-		97.270	0.000	112.925	N/A

Project Cost Totals	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	15.655	17.213	104.996	-	104.996	0.000	137.864	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Development of SMDC MMC Force Tracking																												
Jericho Thunder Analysis Support																												
SMDC NanoSat Analysis (SNAP, KE)																												
Space Superiority Joint Architecture Analysis																												
Force Design Assessment of Army Forces																												
NAVWAR/PNT Gap Analysis and Advocacy																												
Implications of the Emerging "Third" Offset Strategy for SMDC Space																												
Space Simulation Support to TRADOC ARCIC Experimentation																												
Common Ground Station Operating Concept and Requirement Document																												
NAVWAR Defense/Attack Operating Concepts and Requirement																												
Army Enduring JFFT Development																												
High Altitude Persistent Platform Capability Development Docu																												
NAVWAR/PNT in Denied Environment																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Space Superiority Capability Development	[Redacted]																											
Counter ISR Capability Development	[Redacted]																											
Space Operations Multi-Domain Environment Analysis	[Redacted]																											
ICEWS Study	[Redacted]																											
High Altitude Impacts on Ground Effectiveness Study	[Redacted]																											
NAVWAR Characterization Study	[Redacted]																											
NAVWAR Attack Study	[Redacted]																											
Psuedolite Performance Analysis	[Redacted]																											
APNT CFT Analysis Support	[Redacted]																											
Joint Space Warfighting Forum (JSWF) Analysis Support	[Redacted]																											
Support of the APN/CFT	[Redacted]																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

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
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Development of SMDC MMC Force Tracking	1	2018	4	2023
Jericho Thunder Analysis Support	1	2019	4	2024
SMDC NanoSat Analysis (SNAP, KE)	1	2019	4	2024
Space Superiority Joint Architecture Analysis	1	2018	4	2023
Force Design Assessment of Army Forces	1	2019	4	2022
NAVWAR/PNT Gap Analysis and Advocacy	1	2018	4	2024
Implications of the Emerging "Third" Offset Strategy for SMDC Space	1	2019	2	2019
Space Simulation Support to TRADOC ARCIC Experimentation	1	2018	4	2023
Common Ground Station Operating Concept and Requirement Document	1	2019	3	2019
NAVWAR Defense/Attack Operating Concepts and Requirements Documentation	1	2018	4	2023
Army Enduring JFFT Development	1	2018	4	2023
High Altitude Persistent Platform Capability Development Document	1	2018	4	2023
NAVWAR/PNT in Denied Environment	1	2019	2	2020
Space Superiority Capability Development	1	2018	4	2023
Counter ISR Capability Development	3	2017	4	2023
Space Operations Multi-Domain Environment Analysis	4	2017	4	2023
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	2024

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206308A / Army Space Systems <i>Integration</i>	Project (Number/Name) FE5 / Space And Missile Defense <i>Integration</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
Joint Space Warfighting Forum (JSWF) Analysis Support	1	2018	4	2024
Support of the APN/CFT	1	2018	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FE6: Army Space System Enhancement/Integration	-	14.466	21.094	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	35.560
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).