| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)* | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A *I Network C3I Advanced Technology* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| Total Program Element | - | 0.000 | 142.899 | 158.608 | - | 158.608 | 163.892 | 164.038 | 136.149 | 137.936 | 0.000 | 903.522 |
| AM7: *Modular RF Communications Advanced Technology* | - | 0.000 | 15.376 | 13.913 | - | 13.913 | 8.193 | 8.093 | 0.000 | 0.000 | 0.000 | 45.575 |
| AM9: *Protected SATCOM Advanced Technology* | - | 0.000 | 0.000 | 16.639 | - | 16.639 | 27.274 | 31.770 | 12.242 | 0.000 | 0.000 | 87.925 |
| AN2: *Narrowband SATCOM Advanced Technology* | - | 0.000 | 0.000 | 4.995 | - | 4.995 | 9.991 | 15.985 | 0.000 | 0.000 | 0.000 | 30.971 |
| AN4: *Non Traditional Waveforms Advanced Technology* | - | 0.000 | 5.346 | 7.792 | - | 7.792 | 7.993 | 4.460 | 5.537 | 6.412 | 0.000 | 37.540 |
| AN6: *Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech* | - | 0.000 | 1.944 | 1.998 | - | 1.998 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.942 |
| AN8: *COE - Every Receiver is a Sensor Advanced Tech* | - | 0.000 | 5.810 | 2.997 | - | 2.997 | 2.997 | 2.997 | 6.430 | 6.430 | 0.000 | 27.661 |
| AO1: *UNT - Every Receiver is a Sensor Advanced Tech* | - | 0.000 | 6.512 | 2.997 | - | 2.997 | 3.057 | 3.118 | 3.152 | 3.152 | 0.000 | 21.988 |
| AO3: *Stand-In Advanced RF Effects (STARE) Adv Tech* | - | 0.000 | 1.944 | 2.997 | - | 2.997 | 2.997 | 3.057 | 3.091 | 3.091 | 0.000 | 17.177 |
| AO6: *Tag Track and Locate Small Satellites Adv Tech* | - | 0.000 | 13.593 | 16.659 | - | 16.659 | 16.939 | 17.485 | 17.680 | 17.859 | 0.000 | 100.215 |
| AO7: *EW for Maneuver Operations (EMO) Adv Tech* | - | 0.000 | 4.145 | 2.916 | - | 2.916 | 3.042 | 3.113 | 3.147 | 3.147 | 0.000 | 19.510 |
| AP6: *C4ISR Integrated Demonstrations Advanced Tech* | - | 0.000 | 4.414 | 3.740 | - | 3.740 | 3.886 | 4.038 | 4.149 | 4.149 | 0.000 | 24.376 |
| AP8: *Comms/Horiz Int for Army Mod Priorities Adv Tech* | - | 0.000 | 0.660 | 8.075 | - | 8.075 | 10.573 | 10.110 | 10.324 | 10.355 | 0.000 | 50.097 |
| AP9: *Next Generation HF Advanced Technology* | - | 0.000 | 5.832 | 6.994 | - | 6.994 | 6.923 | 0.000 | 3.309 | 6.452 | 0.000 | 29.510 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army | | | | | | | | | | Date: February 2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)* | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A *I Network C3I Advanced Technology* | | | | | | | |
| AQ1: *Spectrum Obfuscation Advanced Technology* | - | 0.000 | 5.832 | 3.885 | - | 3.885 | 3.988 | 3.826 | 3.763 | 1.698 | 0.000 | 22.992 |
| AQ5: *Sensor CE-Integrated Sensor Architecture Adv Tech* | - | 0.000 | 1.466 | 1.998 | - | 1.998 | 2.048 | 1.499 | 2.020 | 2.040 | 0.000 | 11.071 |
| AQ8: *High Tempo Data Driven Decision Tools Adv Tech* | - | 0.000 | 0.000 | 3.022 | - | 3.022 | 4.253 | 5.331 | 5.037 | 7.735 | 0.000 | 25.378 |
| AR2: *Energy Informed Operations Advanced Technology* | - | 0.000 | 1.944 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.944 |
| AR4: *Intelligent Env Battlefield Awareness Adv Tech* | - | 0.000 | 0.641 | 3.257 | - | 3.257 | 4.125 | 4.184 | 5.201 | 7.334 | 0.000 | 24.742 |
| AR6: *Understanding the Environment as a Threat Adv Tech* | - | 0.000 | 2.245 | 2.809 | - | 2.809 | 2.555 | 3.301 | 3.656 | 4.636 | 0.000 | 19.202 |
| AR8: *Sensing in Contested Environments Adv Tech* | - | 0.000 | 0.000 | 0.983 | - | 0.983 | 1.631 | 1.798 | 1.818 | 2.814 | 0.000 | 9.044 |
| AS9: *Persistent Geophysical Sensing-Infrasound Adv Tech* | - | 0.000 | 2.511 | 4.774 | - | 4.774 | 2.479 | 2.281 | 2.553 | 2.776 | 0.000 | 17.374 |
| AT3: *Subterranean Detection and Monitoring Adv Tech* | - | 0.000 | 1.059 | 3.488 | - | 3.488 | 2.245 | 0.000 | 1.233 | 1.384 | 0.000 | 9.409 |
| AT5: *GeoINT - OPS Merge Advanced Technology** | - | 0.000 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 4.988 | 6.537 | 0.000 | 11.525 |
| AT8: *Network-Enabled GeoSpatial-GEOINT Services AdvTech* | - | 0.000 | 3.880 | 2.997 | - | 2.997 | 3.097 | 4.522 | 0.000 | 0.000 | 0.000 | 14.496 |
| AU1: *Tactical GeoSpatial Information Capabilities ATech* | - | 0.000 | 2.012 | 3.740 | - | 3.740 | 4.259 | 5.860 | 0.000 | 0.000 | 0.000 | 15.871 |
| AU2: *Optimization of Geospatial Data for Visualization* | - | 0.000 | 0.000 | 2.098 | - | 2.098 | 2.198 | 1.798 | 1.782 | 1.800 | 0.000 | 9.676 |
| AU4: *Geospatially Enabled Operational Design Adv Tech* | - | 0.000 | 4.819 | 8.205 | - | 8.205 | 8.054 | 7.663 | 0.000 | 0.000 | 0.000 | 28.741 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army | | | | | | | | | | | | Date: February 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)* | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A *I Network C3I Advanced Technology* | | | | | | | |
| AU6: *Automated Analytics for Operational Environment AT* | - | 0.000 | 1.661 | 0.000 | - | 0.000 | 0.000 | 0.000 | 2.278 | 2.278 | 0.000 | 6.217 |
| AU8: *GEOInt/Ops Integration for Multi-echelon Orders** | - | 0.000 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 6.805 | 7.604 | 0.000 | 14.409 |
| AV1: *GEOInt/Ops Logistics Integration-Planning Adv Tech* | - | 0.000 | 0.000 | 3.914 | - | 3.914 | 3.915 | 2.897 | 4.948 | 4.948 | 0.000 | 20.622 |
| AV2: *LEO Advanced Technology* | - | 0.000 | 1.927 | 1.979 | - | 1.979 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.906 |
| AV4: *Foundational S&T for Network C3I Advanced Tech* | - | 0.000 | 0.000 | 2.126 | - | 2.126 | 2.646 | 2.859 | 2.949 | 2.949 | 0.000 | 13.529 |
| AV8: *Navigation Warfare (NAVWAR) Advanced Technology* | - | 0.000 | 5.118 | 2.535 | - | 2.535 | 2.044 | 1.998 | 5.968 | 5.968 | 0.000 | 23.631 |
| AW2: *Autonomous Navigation Advanced Technology* | - | 0.000 | 0.292 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.292 |
| AW4: *DoD PNT M&S Collaborative Initiative (CI) Adv Tech* | - | 0.000 | 2.916 | 2.997 | - | 2.997 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.913 |
| AW6: *Modular GPS Independent Sensors Advanced Tech* | - | 0.000 | 0.000 | 11.089 | - | 11.089 | 10.490 | 9.995 | 12.089 | 14.388 | 0.000 | 58.051 |
| BP4: *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)* | - | 0.000 | 39.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 39.000 |

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2021

**Note**

In Fiscal Year (FY) 2020 this Program Element (PE) was previously funded, with continuity of effort realigned from the following PEs:

* PE 0603006A Space Application Advanced Technology
* PE 0603270A Electronic Warfare Technology
* PE 0603710A Night Vision Advanced Technology
* PE 0603728A Environmental Quality Technology Demonstrations
* PE 0603734A Military Engineering Advanced Technology
* PE 0603772A Advanced Tactical Computer Science and Sensor Technology

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603463A *I Network C3I Advanced Technology* |

* PE 0603794A C3 Advanced Technology

**A. Mission Description and Budget Item Justification**

This PE matures and demonstrates technologies to provide an Army tactical network and enabling infrastructure that support operations in any environment, to include where the electromagnetic spectrum is denied or degraded. This is accomplished through the exploitation and optimization of components and systems for robust, low signature communications and data networks; assured positioning, navigation, and timing in contested environments; converged and coordinated cyber and electronic warfare activities; resilient mission command on the move; and the collection, processing, and dissemination of information for intelligence, surveillance, and reconnaissance.

Work in this PE complements PE 0602146A (Network C3I Technology), PE 0602782A (Command, Control, Communications Technology), PE 0602143A (Soldier Lethality Technology), PE 0602145A (Next Generation Combat Vehicle Technology), PE 0602146A (Network C3I Technology), PE 0602147A (Long Range Precision Fires Technology), PE 0602148A (Future Vertical Lift Technology), PE 0602150A (Air and Missile Defense Technology), PE 0603118A (Soldier Lethality Advanced Technology), PE 0603462A (Next Generation Combat Vehicle Advanced Technology), PE 0603464A (Long Range Precision Fires Advanced Technology), PE 0603465A (Future Vertical Lift Advanced Technology), and PE 0603466A (Air and Missile Defense Advanced Technology).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work is performed by the U.S. Army Futures Command (AFC), the U.S. Army Space and Missile Defense Command (SMDC) and U.S. Army Engineer Research and Development Center (ERDC).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 106.899 | 129.790 | - | 129.790 |
| Current President's Budget | 0.000 | 142.899 | 158.608 | - | 158.608 |
| Total Adjustments | 0.000 | 36.000 | 28.818 | - | 28.818 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -3.000 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 39.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Adjustments to Budget Years | - | - | 28.818 | - | 28.818 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603463A *I Network C3I Advanced Technology* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** BP4: *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)* | | |
| Congressional Add: *Unmanned Aerial Systems and Aerostat Operations* | - | 4.000 |
| Congressional Add: *Sensor Advanced Technology* | - | 10.000 |
| Congressional Add: *Assured Position, Navigation, and Timing* | - | 9.000 |
| Congressional Add: *Payload and Ground Segment Research and Development for Small Satellite Science and Security Applications* | - | 5.000 |
| Congressional Add: *Urban Subterranean Mapping Technology* | - | 3.000 |
| Congressional Add: *Anticipating Threats to Natural Systems* | - | 6.000 |
| Congressional Add: *Army Visual and Tactical Arctic Reconnaissance* | - | 2.000 |
| Congressional Add Subtotals for Project: BP4 | - | 39.000 |
| Congressional Add Totals for all Projects | - | 39.000 |

**Change Summary Explanation**

Fiscal Year 2020 (FY20) increase related to $39.000 Million of congressional add funding.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AM7 / *Modular RF Communications Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AM7: *Modular RF Communications Advanced Technology* | - | 0.000 | 15.376 | 13.913 | - | 13.913 | 8.193 | 8.093 | 0.000 | 0.000 | 0.000 | 45.575 |

**Note**

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

This Project optimizes autonomous networking protocols to automate the Primary, Alternate, Contingency, and Emergency (PACE) communication plan to initialize, adapt, and continue operations under changing environments and threats. Work in this Project complements PE 06022146A/\Project AM6 (Modular RF Communications Technology).

All FY20 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Modular RF Communications Advanced Technology | - | 14.678 | 13.913 |
| ***Description:*** This project optimizes autonomous networking protocols to automate the Primary, Alternate, Contingency, and Emergency (PACE) communication plan to initialize, adapt, and continue operations under changing environments and threats.<br><br>***FY 2020 Plans:***<br>Optimize autonomous techniques and algorithms for network initialization, detection, and/or adaption; optimize the architecture design to enable validation of algorithms for network and networking technology initialization from initial start-up condition and/or initial contact with an autonomous networking algorithm; demonstrate multiple approaches to autonomous networking by providing algorithms to detect available networks and networking technologies available to a single node or user, initialize network technology, and/or adapt the changing environmental conditions, such as hostile electronic warfare emitters; mature shared interfaces between network technologies and an autonomous networking algorithms to enable initialization, detection, selection, and/or control of networks and demonstrate the interfaces enabling the autonomous network operation in a relevant laboratory | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AM7 / *Modular RF Communications Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| environment; validate initial instantiation of the network routing algorithms are able to optimally select and switch among the available networks to traverse data from originator to consumer across the overall tactical network in congested and electronic warfare contested environments; deliver initial routing and switching software code and documentation for demonstration in program of record systems; and publish the first version of an interface standard between network technologies and an autonomous network detection and adaptation algorithms.<br>***FY 2021 Plans:***<br>Will mature the design to perform over disparate transport networks across multiple security classifications enabling a unified network operations across the Army Brigade network; refine and mature the algorithms to enable distributed decision making by coordinating and cooperating among decision engines distributed across the network; demonstrate the auto Primary, Alternate, Contingency, and Emergency (PACE) capability to initialize, detect, and adapt the network to the changing conditions and threats in a relevant field based experiment; refine the architecture for modularity, develop interfaces with external systems to exchange information, and mature interface standards; and develop specifications for the next phase of capability to incorporate Artificial Intelligence/Machine Learning (AI/ML) techniques.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort was decreased to support higher priority modernization efforts. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.698 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 15.376 | 13.913 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AM9 / *Protected SATCOM Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AM9: *Protected SATCOM Advanced Technology* | - | 0.000 | 0.000 | 16.639 | - | 16.639 | 27.274 | 31.770 | 12.242 | 0.000 | 0.000 | 87.925 |

**Note**

In Fiscal Year 2021 (FY21) this Project was realigned from:
Program Element (PE) 0602146 C3 Advanced Technology
* Project AN9 UNT - Every Receiver is a Sensor Technology
PE 0603463A Network C3I Advanced Technology
* Project AO1 UNT-Every Receiver is a Sensor Adv Tech

**A. Mission Description and Budget Item Justification**

This project matures and demonstrates technologies and components to increase resiliency of Wideband Satellite Communications (SATCOM) in contested and congested electromagnetic environments. This effort improves resiliency through science & technology investigation. Will compliment technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities.

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 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Protected SATCOM Advanced Technology and Resilient Tactial Networking and Comms | - | - | 12.543 |
| ***Description:*** This project matures and demonstrates technologies and components to increase resiliency of Wideband SATCOM in contested and congested electromagnetic environments. This effort improves resiliency through science & technology investigation. Will compliment technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities.<br><br>***FY 2021 Plans:***<br>Will optimize and select those SATCOM technologies that will automatically adapt to constantly changing, congested, and contested environments; conduct demonstrations to establish a baseline for future research of intelligent satellite communications (i.e., systems that automatically adapt and mitigate network problems); mature and optimize components that support the control of the Army satellite network in a contested environment; mature and optimize Army capabilities through the exploitation of emerging commercial Low Earth Orbit (LEO) technologies and conduct demonstrations using these same technologies in a contested environment; and provide tactical SATCOM advantage to the US Army by demonstrating commercial LEO technologies | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AM9 / *Protected SATCOM Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| that will validate improvements to Tactical SATCOM Network Resiliency and inform future Next Generation Tactical Terminal Development.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This funding was realigned from PE 0602146A Network C3I Technology, Project AN9 UNT - Every Receiver is a Sensor Technology and PE 0603463A Network C3I Advanced Technology, Project AO1 UNT - Every Receiver is a Sensor Advanced Tech in FY2021 to fund this high priority effort. | | | |
| ***Title:*** High Altitude: Wideband Global Satellite Communications (SATCOM) (WGS) Ka Band Surrogate Payload / Aerial Tier Networking<br>***Description:*** Demonstrate a WGS surrogate payload for usage on a High Altitude Platform (HAP) with seamless transition to existing ground terminals by modifying existing solutions to support Capability Sets (CS), beginning with CS 23: Capacity & Resiliency. This work complements technology development performed on PE 0602146/BZ8 (Aerial Tier Networking).<br>***FY 2021 Plans:***<br>Will mature and demonstrate WGS Ka Band Surrogate Payload which includes low power RF components and antenna optimized for the HAP field of view; improve performance of SATCOM terminal and modem so that they can acquire and track the HAP and be able to hand over to a second HAP; and integrate the WGS Surrogate Payload into the platform utilizing leased or purchased HAP enabling the anticipated performance improvement.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This funding was realigned from PE 0602146A Network C3I Technology, Project AN9 UNT - Every Receiver is a Sensor Technology and PE 0603463A Network C3I Advanced Technology, Project AO1 UNT - Every Receiver is a Sensor Advanced Tech in FY2021 to fund this high priority effort. | - | - | 4.096 |
| **Accomplishments/Planned Programs Subtotals** | - | - | 16.639 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | | | | | | | | | | Date: February 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | | | | Project (Number/Name)<br>AN2 / *Narrowband SATCOM Advanced Technology* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| AN2: *Narrowband SATCOM Advanced Technology* | - | 0.000 | 0.000 | 4.995 | - | 4.995 | 9.991 | 15.985 | 0.000 | 0.000 | 0.000 | 30.971 |

**Note**

In Fiscal Year 2021 (FY21) this Project was realigned from:
Program Element (PE) 0602143A C3 Advanced Technology
* Project AN1 Narrowband SATCOM Technology

**A. Mission Description and Budget Item Justification**

This project validates and demonstrates technologies to enable gateway communications across disparate Narrowband Satellite Communications (SATCOM) networks, enabling resiliency in contested environments. The Narrowband SATCOM network is the largest tactical network operated by the Army to provide situational understanding across all echelons. This project optimizes technologies and protocols to enable risk mitigation solution sets and awareness through adaptive learning capabilities.

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 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Narrowband SATCOM Advanced Technology | - | - | 4.995 |
| ***Description:*** This project validates and demonstrates technologies to enable gateway communications across disparate Narrowband Satellite Communications (SATCOM) networks, enabling resiliency in contested environments. | | | |
| ***FY 2021 Plans:***<br>Will optimize Narrowband SATCOM products based on schedule requirements, performance requirements, and integration needs for laboratory demonstrations in support of the Network, Long Range Precision Fires, Air & Missile Defense and Next Generation Combat Vehicle use case scenarios; demonstrate in a congested and contested environment to determine system design performance and assess human in-the-middle activities; demonstrate augmented artificial intelligence/machine learning operations in a congested and contested environment; and mature and demonstrate Narrowband SATCOM hardware and software. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AN2 / *Narrowband SATCOM Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| This funding was realigned from PE 0602143A Soldier Lethality Technology, Project AN1 Narrowband SATCOM Technology. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 4.995 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | | | | Project (Number/Name)<br>AN4 / *Non Traditional Waveforms Advanced Technology* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| AN4: *Non Traditional Waveforms Advanced Technology* | - | 0.000 | 5.346 | 7.792 | - | 7.792 | 7.993 | 4.460 | 5.537 | 6.412 | 0.000 | 37.540 |

**Note**

In Fiscal Year (FY) 2020 this project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

This Project demonstrates non-traditional waveforms and technologies for resilient communications in contested environments providing anti-jam, low probability of intercept, and low probability of detection for the dismounted and vehicular user. This Project optimizes technologies not typically applied to the tactical environment, such as millimeter wave communications and directional networking with coherent combining of radio frequency signals, to maintain networked communications in and under contested and congested electromagnetic spectrum environments. Work in this Project complements PE 06022146A/Project AN3 (Non Traditional Waveforms Technology).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Non Traditional Waveforms Advanced Technology | - | 5.103 | 7.792 |
| ***Description:*** This project demonstrates non-traditional waveforms and technologies for resilient communications in contested environments providing anti-jam, low probability of intercept, and low probability of detection for the dismounted and vehicular user. This project optimizes technologies not typically applied to the tactical environment, such as millimeter wave communications and directional networking with coherent combining of radio frequency signals, to maintain networked communications in and under contested and congested electromagnetic spectrum environments. | | | |
| ***FY 2020 Plans:***<br>Mature cooperative beamforming technology to support dismounted or mounted operations; provide increased capacity in a contested environment to dismounted and mounted communications using cooperative technology, such as the dismount distributed tactical beamforming system, to support additional number of users and data throughput; demonstrate dismounted | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AN4 / *Non Traditional Waveforms Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| network technology providing local networking among dismounted unit in support of low probability of detection/intercept communication to distant nodes, using technology such as distributed cooperative beamforming; and demonstrate millimeter wave communications systems in a relevant field environments to validate performance characteristics of the delivered technology.<br>***FY 2021 Plans:***<br>Will enhance low probability of intercept, low probability of detection as well as anti-jam technology while supporting dismounted and mounted systems to operate in relative contested and congested environments, using technologies such as distributed cooperative beamforming in conjunction with dismounted communication devices and highly directional millimeter wave systems using techniques such as amplitude control and advanced signal processing techniques; mature adaptive power control techniques and dismounted networking; and mature the millimeter wave demonstration system for at least a three node system with enhanced discovery and tracking speeds as well as advanced networking protocol enhancements for a highly directional network Mobile Ad hoc Network (MANET) for mounted operations at operational distances and throughputs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding in this effort increased from lower priority modernization areas. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.243 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 5.346 | 7.792 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AN6 / *Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN6: *Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech* | - | 0.000 | 1.944 | 1.998 | - | 1.998 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.942 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

This Project matures technologies providing increased resiliency for Wideband Satellite Communications (SATCOM) from contested and congested electromagnetics through the use of technologies including adaptive interference mitigation and diversity through multiple paths. Wideband SATCOM is the primary high-bandwidth Beyond Line of Sight (BLOS) Communications used by the tactical Army and this project demonstrates protection of this valuable communication link. Work in this Project complements PE 06022146A/Project AN5 (Protected SATCOM-WB Global SATCOM Inter Canc Tech).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech | - | 1.856 | 1.998 |
| ***Description:*** This project matures technologies providing increased resiliency for Wideband Satellite Communications (SATCOM) from contested and congested electromagnetics through the use of technologies including adaptive interference mitigation and diversity through multiple paths. Wideband SATCOM is the primary high-bandwidth Beyond Line of Sight (BLOS) Communications used by the tactical Army and this project demonstrates protection of this valuable communication link. | | | |
| ***FY 2020 Plans:***<br>Optimize Wideband Global Satellite (WGS) Ka-band interference cancelling technology modem algorithms based on lessons learned from previous over the air demonstrations; validate the Ka-band interference cancelling technology planning tool predicted | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AN6 / *Prot SATCOM-WB Global SATCOM Inter Canc Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| performance matches actual field demonstration performance against Warfare (EW) threats; and provide modem enhancements to validate Ka-band interference cancelling technology for field based demonstrations.<br>***FY 2021 Plans:***<br>Will mature and demonstrate Ka-band interference cancelling technology and planning tool in field based demonstrations and support transition of the Ka-band interference cancelling technologies into a Program of Record.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding increase to execute demonstrations of Ka-band interference cancelling technology. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.088 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.944 | 1.998 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AN8 / *COE - Every Receiver is a Sensor Advanced Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN8: *COE - Every Receiver is a Sensor Advanced Tech* | - | 0.000 | 5.810 | 2.997 | - | 2.997 | 2.997 | 2.997 | 6.430 | 6.430 | 0.000 | 27.661 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology, Project:
* 243 Sensors and Signals Processing

**A. Mission Description and Budget Item Justification**

This Project optimizes automated exploitation and fusion analysis tools, applications, and software services that harvest, correlate and fuse tactical receiver sources with new and emerging data sources to improve understanding of the threat picture and more efficiently support near-real time Situational Understanding of the battlefield.

Work in this Project complements PE 06033463A (Network C3I Advanced Technology) \ Project AO1 (UNT - Every Receiver is a Sensor Advanced Tech).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advanced Data Analytics for Situational Awareness | - | 5.546 | 2.997 |
| ***Description:*** This effort improves software technologies for intelligence/mission command (MC) mission collaboration to provide faster and higher quality decision making support for the commander and his key staff. Specific efforts focus on integrating intelligence, surveillance and reconnaissance (ISR) planning and execution at the Task Force/Battalion through troop-level, as well as efforts that provide the capability to identify, fuse, and trace/track specific targets in an asymmetric environment. Work accomplished under Program Element (PE) 0602146A/Project AN7 complements this effort. | | | |
| ***FY 2020 Plans:***<br>Evaluate open source and commercial-off-the-shelf (COTS) technologies to support the creation of a converged data platform which will unify tactical data silos across the warfighting functions (such as: Intel and Operations data sets), resolve data access limitations, and prioritize critical data sharing. Integrate selected data management and information sharing technologies to create | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AN8 / *COE - Every Receiver is a Sensor Advanced Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| initial converged data platform and demonstrate the improvement to tactical situational awareness in both timeliness and accuracy by maturing initial analytic capabilities, leveraging these aggregated data sources, to the converged data platform.<br><br>Evaluate and define communication pathways between current Mission Command, Fires, and Intelligence systems and scope potential deficiencies and latencies; map current Army and Joint targeting protocols to proposed data flows and identify potential for algorithmic support; mature system platforms capable of managing cross-domain, multi-INT, multi-platform data flows, and evaluate on the basis of speed, accuracy, and data integrity; develop and demonstrate initial multi-INT algorithms capable of facilitating timely creation of intelligence to support long range fires missions; and mature and demonstrate algorithms that can support distributed processing, exploitation, and dissemination (PED) workflows, increase automation, and augment analyst?s capabilities.<br><br>***FY 2021 Plans:***<br>Will mature the data platform with emphasis on intelligence and operations convergence through the application of advanced analytic capabilities; conduct a capability demonstration with a user jury to help establish baseline performance enhancements to situational awareness, and decreased time to action; and integrate additional data stores to capture estimates of future costs to extend the data platform further into relevant data stores.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort was realigned to support higher modernization priority areas | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br><br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br><br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.264 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 5.810 | 2.997 |

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

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AN8 / *COE - Every Receiver is a Sensor Advanced Tech* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AO1 / *UNT - Every Receiver is a Sensor Advanced Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AO1: *UNT - Every Receiver is a Sensor Advanced Tech* | - | 0.000 | 6.512 | 2.997 | - | 2.997 | 3.057 | 3.118 | 3.152 | 3.152 | 0.000 | 21.988 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int
PE 0603772A Electronic Warfare Technology, Projects:
* K15 Advanced Comm ECM Demo
* K16 Non-Commo ECM Tech Dem

**A. Mission Description and Budget Item Justification**

This Project demonstrates high fidelity Cyber-Electromagnetic Activity (CEMA) situational understanding by exploiting tactical receivers with sufficient capabilities as sensors. This Project optimizes real-time radio frequency mapping of the tactical environment in support of network operation and decision making. Work in this Project complements PE 06022146A (Network C3I Technology) \ Project AN9 (UNT - Every Receiver is a Sensor Technology).

Work in this Project complements PE 06033463A (Network C3I Advanced Technology) \ Project AN8 (COE Every Receiver is a Sensor Technology).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Unified Network Transport (UNT) - Every Receiver is a Sensor Advanced Tech | - | 1.821 | - |
| ***Description:*** This project demonstrates high fidelity Cyber-Electromagnetic Activity (CEMA) situational understanding by exploiting tactical receivers with sufficient capabilities as sensors. This project optimizes real-time radio frequency mapping of the tactical environment in support of network operation and decision making. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO1 / *UNT - Every Receiver is a Sensor Advanced Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Mature software algorithms on a software defined radio and demonstrate advanced radio tasking capabilities; validate performance measures for dynamic spectrum sensing/advanced tasking algorithms in a relevant laboratory environment; and optimize advanced tasking algorithms for use on legacy fielded systems to increase the number of sensors on the battlefield.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort was realigned to PE 0603463A (Network C3I Advanced Technology) / AM9 (Protected SATCOM Advanced Technology) in FY21. | | | |
| ***Title:*** Multi Intelligence Modernization supporting Multifunction Operations<br>***Description:*** This effort will optimize Intelligence Community investments in software frameworks and exploits against threat SOIs to mature a library of open, modular, and scalable software solutions that address identified capability gaps and to provide the commander with electronic situational awareness while at the same time protecting his assets from enemy deception and jamming. Work accomplished under PE 0602146/Project AN7 complement this effort.<br>***FY 2020 Plans:***<br>Mature and demonstrate electronic support functions suitable for operation in a highly contested environment with enhanced techniques for geolocation; and integrate techniques to harden and protect electronic support and attack assets from enemy electronic warfare.<br>***FY 2021 Plans:***<br>Will optimize high altitude long stand-off RF payloads designed to operate above contested environments; demonstrate techniques and technologies developed to protect Electronic Support assets from adversaries? deception and jamming; and mature and demonstrate software frameworks that facilitate rapid fielding of new capabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Nominal planned change of scope. | - | 2.827 | 2.997 |
| ***Title:*** Highly Distributable UGS<br>***Description:*** This effort will mature a small, low cost sensor capability that can be distributed in mass quantity and tailored to specific electro-magnetic signals or other modalities (i.e. seismic) to allow the tactical commander to obtain relevant situational awareness data within a signal dense and contested operational environment.<br>***FY 2020 Plans:*** | - | 1.568 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO1 / *UNT - Every Receiver is a Sensor Advanced Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Mature and demonstrate advanced ultra-low cost disposable sensing capabilities suitable for operation in a highly contested environment and demonstrate distributed signal survey utilizing large quantities of such sensors; and demonstrate distributed sensor information feeding the larger electronic warfare framework for improved situational understanding.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This funding was realigned to PE 0603457A C3I Cyber Advanced Development, Project 9CY Network Access and Effects. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.296 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 6.512 | 2.997 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | | | | Project (Number/Name)<br>AO3 / *Stand-In Advanced RF Effects (STARE) Adv Tech* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| AO3: *Stand-In Advanced RF Effects (STARE) Adv Tech* | - | 0.000 | 1.944 | 2.997 | - | 2.997 | 2.997 | 3.057 | 3.091 | 3.091 | 0.000 | 17.177 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int
PE 0603270A Electronic Warfare Technology, Project:
* K15 Advanced Comm ECM Demo

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates technologies and capabilities to provide a robust and reliable communications capabilities by leveraging commercial technologies and enhancing their operation to maintain network connectivity in contested and congested environments. Work in this Project complements PE 06022146A (Network C3I Technology) \ Project AO2 (Robust Grey C3I Technology).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Robust Grey C3I Advanced Technology | - | 1.856 | - |
| ***Description:*** This effort matures and demonstrates technologies and capabilities to provide a robust and reliable communications capabilities by leveraging commercial technologies and enhancing their operation to maintain network connectivity in contested and congested environments. | | | |
| ***FY 2020 Plans:***<br>Optimize enhancements to commercial off-the-shelf technologies, such as cellular and/or narrowband communications, to provide dismount and mounted operators with long-range connectivity in a hostile electromagnetic spectrum environment; and | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO3 / *Stand-In Advanced RF Effects (STARE) Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| demonstrate low probability of detection/intercept and/or anti-jam enhancements, such as radio frequency directionality and/or frequency/modulation coding, in a relevant field environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort was realigned to support higher modernization priority areas | | | |
| ***Title:*** Stand-In Advanced RF Effects Advanced Technology<br>***Description:*** This effort harvests investments from 6.2 component level maturation and hardware synchronization research, to mature hardware for demonstration of capabilities for distributed Electronic Warfare.<br>***FY 2021 Plans:***<br>Will harvest investments from 6.2 component level maturation, and hardware synchronization research and development, to mature hardware demonstration capabilities for distributed Electronic Warfare; validate initial countermeasures on distributed systems for evaluating performance metrics; evaluate performance metrics against one category of threats.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding change reflects planned life cycle of this effort. | - | - | 2.997 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.088 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.944 | 2.997 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AO6 / *Tag Track and Locate Small Satellites Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AO6: *Tag Track and Locate Small Satellites Adv Tech* | - | 0.000 | 13.593 | 16.659 | - | 16.659 | 16.939 | 17.485 | 17.680 | 17.859 | 0.000 | 100.215 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603006A Space Application Advanced Technology, Project:
* 592 Space Application Tech

**A. Mission Description and Budget Item Justification**

Tag, Track, and Locate (TT&L) Small Satellites Advanced Technology matures and demonstrates payloads, sensors, and data down link systems for tactically responsive space and high altitude platforms supporting Army ground forces. TT&L matures, demonstrates, and integrates lightweight materials, hardware components with reduced power consumption, and advanced data collection, processing, and dissemination capabilities; also improves algorithms that process space and near space sensor data in real and near real time for integration into battlefield operating systems.

TT&L efforts will include:
- Technical demonstration of a sensor designed to provide space-based situational awareness to the tactical Warfighter;
- Development and demonstration of small satellite capabilities, which include classified payloads, to provide Assured Positioning, Navigation, and Timing services to the tactical ground component Warfighters;
- Constellation of space-based sensors that provide Reconnaissance, Surveillance, and Target Acquisition (RSTA) and Situational Awareness (SA) to the ground force commander to support Multi-Domain Operations (MDO);
- Applied research in quantum sciences based communications, sensing, and data teleportation to mature current technologies for small spacecraft applications.

These efforts support the Army's ability to control and exploit space assets that contribute to current and future military operations as defined in the national, Department of Defense (DOD), and Army future space strategies.

Work supports the Army Modernization Priorities.

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

Work in this Project is performed by the United States Army Space and Missile Defense Command (USASMDC) Technical Center (TC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Tag, Track, and Locate Small Satellites | - | 12.976 | 16.659 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO6 / *Tag Track and Locate Small Satellites Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** This effort matures and demonstrates technologies required for smaller, warfighter-responsive sensor and communication Low Earth Orbit small satellite constellations. Work will augment, improve, exploit and optimize existing commercial and DoD technologies and networks. Work supports the Army Modernization Priorities.<br><br>This effort will validate software, hardware, and algorithms used to enable space-based capabilities in support of the Army?s Modernization Priorities. This effort will exploit commercial advances and opportunities in small satellite constellation and payload management toward future Army concepts.<br><br>The work cited is consistent with the Under Secretary of Defense for Research and Engineering Science and Technology (S&T) priority focus areas and the Army Modernization Strategy.<br>This work is performed by the Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT) in Huntsville, AL.<br><br>***FY 2020 Plans:***<br>Optimize and demonstrate technologies, and validate software/algorithms, for tracking and locating objects of interest to improve performance of space-based signal detection, processing, and dissemination; exploit existing commercial technologies to improve warfighter capabilities.<br>***FY 2021 Plans:***<br>Will mature and demonstrate technologies and validate software/algorithms for tracking and locating objects of interest to improve performance of space-based signal detection/processing/dissemination protocols, processes, and procedures; exploit existing commercial technologies to improve warfighter capabilities to overcome Anti Access/Area Denial (A2/AD).<br><br>Perform on-orbit checkout testing of SVs including developmental testing prior to executing demonstrations; conduct JMUA and multiple tech demonstrations; participate in joint exercises; perform evaluations of spacecraft performance; participate in exercises to asses military utility; and demonstrate LEO based communications experiment aligned with tactical terminal and waveform development.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program increase to fund higher priority improvements. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer | - | 0.617 | - |
| ***Description:*** Funding transferred in accordance with Title 15 USC ?638 | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO6 / *Tag Track and Locate Small Satellites Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 13.593 | 16.659 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AO7 / *EW for Maneuver Operations (EMO) Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AO7: *EW for Maneuver Operations (EMO) Adv Tech* | - | 0.000 | 4.145 | 2.916 | - | 2.916 | 3.042 | 3.113 | 3.147 | 3.147 | 0.000 | 19.510 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603270A Electronic Warfare Technology, Project:
* K15 Advanced Comm Ecm Demo

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates technologies that understand contested spectrum points, sense, locate, and cue fires missions to create windows of opportunity in A2/AD environments, restore network capabilities, and enable maneuver and fires.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** EW for Maneuver Ops | - | 2.846 | 1.637 |
| ***Description:*** This effort matures and demonstrates hardware and software to conduct electronic warfare (EW) for intelligence, surveillance reconnaissance in support of Army tactical operations.<br><br>***FY 2020 Plans:***<br>Mature stand-in capabilities to find, fix, and locate adversary signals of interest that impact the Army?s ability to use the Electromagnetic Spectrum; mature and demonstrate the capability for distributed platform sensing that efficiently collaborate to convey spectrum Situational Understanding (SU) to the Commander; and demonstrate and validate critical technologies for distributed Electronic Warfare Support (ES) at the Brigade and Below tactical engagement.<br><br>***FY 2021 Plans:***<br>Will mature Electronic Warfare capabilities, for use against sensor systems, that will optimize and demonstrate low Size Weight and Power-Cost (SWaP-C) hardware; validate distribution and coordination capabilities for novel geolocation capabilities in | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO7 / *EW for Maneuver Operations (EMO) Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| simulated environments; and demonstrate these critical technologies for Electronic Warfare (EW) at the Brigade and Below tactical engagement.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort was decreased to support higher modernization priorities | | | |
| ***Title:*** Simultaneous Countermeasure for Active Reconnaissance and Surveillance (SCARS)<br>***Description:*** This effort matures and demonstrates Electronic Warfare capabilities leveraging hardware-in-the-loop and modeling and simulation (M&S) of threat Intelligence, Surveillance, and Reconnaissance (ISR) systems to validate coordinated and collaborative non-kinetic effects.<br>***FY 2020 Plans:***<br>Mature simultaneous Electronic Warfare (EW) techniques against adversarial Intelligence Surveillance and Reconnaissance (ISR) capabilities; and perform laboratory risk reduction experiments in modeling, simulation, and hardware-in-the-loop to validate EW techniques prior to the kinetic engagement.<br>***FY 2021 Plans:***<br>Will demonstrate simultaneous Electronic Warfare (EW) techniques against layered adversary ISR capabilities; and perform evaluation of metrics within high fidelity laboratory environment to validate EW techniques capabilities to alter the kinetic engagement.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Economic adjustment | - | 1.111 | 1.279 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.188 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 4.145 | 2.916 |

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

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AO7 / *EW for Maneuver Operations (EMO) Adv Tech* |

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

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AP6 / *C4ISR Integrated Demonstrations Advanced Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP6: *C4ISR Integrated Demonstrations Advanced Tech* | - | 0.000 | 4.414 | 3.740 | - | 3.740 | 3.886 | 4.038 | 4.149 | 4.149 | 0.000 | 24.376 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

Provides System of Systems (SoS) engineering rigor on Science & Technology (S&T) projects by providing field-based risk reduction processes, quantifiable technology performance in a SoS context, data-driven programmatic decision support, and field-based performance data to supplement Technology Readiness Level (TRL) assessments.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** C4ISR Integrated Demonstrations Advanced Tech | - | 4.214 | 3.740 |
| ***Description:*** This project provides appropriate System of Systems (SoS) engineering rigor on Science & Technology (S&T) projects by providing field-based risk reduction processes, quantifiable technology performance in a SoS context, data-driven programmatic decision support, and field-based performance data to supplement Technology Readiness Level (TRL) Assessments. This project provides network automation, resiliency, and situational understanding through science & technology advancements. | | | |
| ***FY 2020 Plans:***<br>Demonstrate commercial and government off-the-shelf and research and development advanced technologies in themed field-based risk reduction events that informs the Army's Modernization Priorities, including Network/C3I, Future Vertical Lift, Next Generation Combat Vehicle, and Soldier Lethality; provide technology assessments of science & technology efforts, such as millimeter wave communication systems and/or spectrum decoying, in a field relevant environment to demonstrate technology | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AP6 / *C4ISR Integrated Demonstrations Advanced Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| maturation; exploit virtualization to increased venue capabilities by incrementally building a more scalable tactical network; and mature and demonstrate advancement of spectrum collection, injection, and management capabilities.<br>***FY 2021 Plans:***<br>Will demonstrate maturing and emerging commercial and government off-the-shelf research and development advanced technologies in threat-based field experimentation that will inform the Army's Modernization Priorities, including Network/C3I, Future Vertical Lift, Next Generation Combat Vehicle, and Soldier Lethality; assess science & technology efforts in a field-relevant environment to demonstrate technology maturation; optimize virtualization to increase venue capabilities by incrementally building a more scalable tactical network; and mature and demonstrate advancement of spectrum collection, injection, and management capabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort was realigned to support higher priority modernization priorities. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.200 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 4.414 | 3.740 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AP8 / *Comms/Horiz Int for Army Mod Priorities Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP8: *Comms/Horiz Int for Army Mod Priorities Adv Tech* | - | 0.000 | 0.660 | 8.075 | - | 8.075 | 10.573 | 10.110 | 10.324 | 10.355 | 0.000 | 50.097 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

This Project provides unified communications for the Army's modernization priorities through operationally-relevant, end-to-end network demonstrations which leverage Science & Technology (S&T) and commercial technology adapted to mitigate performance gaps in the presence of electronic warfare (EW) systems and reduce network complexity. Work in this Project complements PE 06022146A (Network C3I Technology) / Project AP7 (Comms Support to CSA / Horizontal Integ Fields Tech).

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Communications Support to Army Modernization Priorities/Horizontal Integration Fields Advance Technology | - | 0.630 | 8.075 |
| ***Description:*** This Project provides unified communications for the Army's modernization priorities through operationally-relevant, end-to-end network demonstrations which leverage Science & Technology (S&T) and commercial technology adapted to mitigate performance gaps in the presence of electronic warfare (EW) systems and reduce network complexity. | | | |
| ***FY 2020 Plans:***<br>Will demonstrate commercial and/or government off-the-shelf technologies which can fulfill interim network requirements for Long Range Precision Fires (LRPF), Next Generation Combat Vehicle (NGCV), Future Vertical Lift (FVL), Air and Missile Defense (AMD), and/or Soldier Lethality (SL), while other network science and technology projects develop future network capabilities. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AP8 / *Comms/Horiz Int for Army Mod Priorities Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will conduct demonstrations at NetModX 21 Field experiment, which is NGCV themed to align with NGCV Robotic Combat Vehicle(RCV) Phase 2 demonstration. Will also provide support to Next Generation Combat Vehicle (NGCV) Robotic Combat Vehicle phase 2 demonstration.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in this effort increased to support multiple demonstrations. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.030 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 0.660 | 8.075 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AP9 / *Next Generation HF Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP9: *Next Generation HF Advanced Technology* | - | 0.000 | 5.832 | 6.994 | - | 6.994 | 6.923 | 0.000 | 3.309 | 6.452 | 0.000 | 29.510 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

**A. Mission Description and Budget Item Justification**

This Project improves performance of technologies to provide assured and resilient reach-back communications in satellite denied or degraded environments. This Project optimizes performance of new high frequency (HF) technology to provide low probability of detection and anti-jam capabilities to overcome emerging electronic warfare threats.

All FY20 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Next Generation HF Advanced Technology | - | 5.568 | 6.994 |
| ***Description:*** This Project improves performance of technologies to provide assured and resilient reach-back communications in satellite denied or degraded environments. This project optimizes performance of new high frequency (HF) technology to provide low probability of detection and anti-jam capabilities to overcome emerging electronic warfare threats. | | | |
| ***FY 2020 Plans:***<br>Optimize software code modifications to the High Frequency (HF) communications waveform to meet the Army?s HF requirements, such as anti-jam and low probability of detection/intercept, and modernization goals to provide resilient long-range reach-back in satellite denied environments; demonstrate the modified software code in a waveform emulator to validate the code?s functionality; demonstrate the modified HF software to validate the enhancements, such as anti-jam and low probability of | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AP9 / *Next Generation HF Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| detection/intercept performance, against pacing threats, such as simulated enemy systems; and optimize software code based on waveform emulator demonstration results; provide waveform code for porting to communications hardware for demonstrations.<br>***FY 2021 Plans:***<br>Will mature the High Frequency (HF) Communications Hub proof-of-concept to provide an assured, resilient, alternate beyond line-of-sight communications link for tactical and strategic Army assets in satellite denied, area denied environments and increased resiliency to enemy detection and interception; demonstrate HF Communications Hub proof-of-concept operating with legacy HF radios in beyond line-of-sight operationally relevant environments to validate desired capabilities, performance, and interoperability; quantify anti-jam, low probability of intercept, and low probability of detection metrics to inform the Army?s HF requirements for resiliency in contested and congested environments; and validate performance metrics through modeling and simulation and demonstrations.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding in this project increased to support maturation of the HF Communications Hub, | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.264 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 5.832 | 6.994 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AQ1 / *Spectrum Obfuscation Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQ1: *Spectrum Obfuscation Advanced Technology* | - | 0.000 | 5.832 | 3.885 | - | 3.885 | 3.988 | 3.826 | 3.763 | 1.698 | 0.000 | 22.992 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603794A C3 Advanced Technology, Project:
* EL4 Tactical Comms and Networking Technology Int

In Fiscal Year (FY) 2021 this Project is being realigned from:
Program Element (PE) 0603118A Warfighter Advanced Technology, Project:
AZ8: Soldier - Small Unit Detectability Adv Technology

**A. Mission Description and Budget Item Justification**

This project validates and demonstrates technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities. This Project optimizes, matures and demonstrates novel materials, technologies, techniques and applications that increase camouflage and concealment capabilities against known and emerging sensor threats, provide effective deception capabilities, increase survivability, mature analytical processes for modeling performance of signature management technologies during multi-domain operations as well as developing combinations of physical and electronic signature decoy components. These technologies will produce proof of concept system demonstrators that decrease the probability of detection and targeting by peer and near-peer adversaries, enabling freedom of movement of semi-independent and dispersed formations

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Spectrum Obfuscation Advanced Technology | - | 5.568 | - |
| ***Description:*** This Project validates and demonstrates technologies that provide obfuscation of radio frequency (RF) spectrum signature in order to counter enemy electronic surveillance capabilities. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AQ1 / *Spectrum Obfuscation Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Optimize the design of a proof-of-concept wideband alluring signal projection (WASP) system to provide electromagnetic spectrum protection through the use of multichannel signal emissions capability to project high-value assets, such as Battalion and Brigade-level command post electromagnetic signatures, on the battlespace; mature and demonstrate a proof-of-concept WASP system in a relevant field environment; and validate improved network communications through the operation of WASP systems to decoy high value targets and attract simulated enemy systems on the battlespace away from high-value assets.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort completes in FY20. | | | |
| ***Title:*** Camouflage, Concealment and Deception<br>***Description:*** This effort demonstrates innovative camouflage, concealment and deception technologies for expeditionary assets (i.e. mission command platforms, battle management centers and supporting equipment) to defeat advanced current and emerging adversary Intelligence, Surveillance and Reconnaissance (ISR) threats, and to reduce the probability of detection in multi-domain operations. Matures physics-based models for material and system performance that support probability of detection metrics in the multi-domain operational environment, assisting in closing the capability gap between current camouflage, concealment and deception technologies and defeating enemy sensorial capabilities in future operating environments.<br>***FY 2021 Plans:***<br>Will mature technologies with the goal of improving the performance of materials and component technologies in support of camouflage and deception efforts for use with high value assets (i.e. mission command platforms, battle management centers and supporting equipment); mature and demonstrate integrated signature management technologies for high-valued assets to improve effectiveness and survivability against hyperspectral sensors to enable expeditionary maneuver and mission command during multi-domain operations.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY21, this effort was realigned from PE 0603118A(Soldier Lethality Advanced Technology/ Project AZ8 (Camouflage, Concealment and Decoys Demonstration). | - | - | 3.885 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | - | 0.264 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AQ1 / *Spectrum Obfuscation Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Funding transferred in accordance with Title 15 USC ?638 | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 5.832 | 3.885 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AQ5 / *Sensor CE-Integrated Sensor Architecture Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQ5: *Sensor CE-Integrated Sensor Architecture Adv Tech* | - | 0.000 | 1.466 | 1.998 | - | 1.998 | 2.048 | 1.499 | 2.020 | 2.040 | 0.000 | 11.071 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603710A Night Vision Advanced Technology, Project:
* K70 Night Vision Adv Tech

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates an interoperability architecture consisting of standards, interfaces, and services. The application managers will have added artificial intelligence and functionality that allows for improved collaboration, survivability and recoverability, security, and adaptability to a dynamic network. Work in this Project supports the Army Science and Technology Network, Next Generation Combat Vehicle, Soldier Lethality, Air and Missile Defense, Long Range Precision Fires and Future Vertical Lift modernization priorities.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Sensor CE - Integrated Sensor Architecture | - | 1.400 | 1.998 |
| ***Description:*** This effort matures and demonstrates an agile and adaptive interoperability sensor architecture that allows a system to dynamically discover and leverage other systems on a network without any specific or prior knowledge across limited, heterogeneous resources and against a peer adversary. The goal of this effort is to develop standards, models, and protocols that provide a common language for sensor systems to connect, publish their capabilities and needs, and interact with other systems, even on disadvantaged networks. The benefits of this effort are increased sensor collaboration, reduced decision timelines, reduced soldier load, and reduced integration costs. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AQ5 / *Sensor CE-Integrated Sensor Architecture Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Demonstrate interoperability on limited-bandwidth communication networks with capability to recover from communication network denial; and mature tasking capability to dynamically fulfill mission objections while reducing operator knowledge burden.<br>***FY 2021 Plans:***<br>Will demonstrate an improvement on bandwidth utilization by performing smart data summary and aggregation; show intelligent high level tasking of multiple disparate sensors to reduce the need for details on each sensor?s unique characteristics; and continue to mature smart subscription services to ensure sensor data goes where it is needed.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program increase to fund higher priority improvements. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.066 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.466 | 1.998 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AQ8 / *High Tempo Data Driven Decision Tools Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQ8: *High Tempo Data Driven Decision Tools Adv Tech* | - | 0.000 | 0.000 | 3.022 | - | 3.022 | 4.253 | 5.331 | 5.037 | 7.735 | 0.000 | 25.378 |

**Note**

This Project is a new start in FY2021.

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates data driven decision tools that help develop cyber SU for commanders. It enhances decision making and accurately assesses and integrates cyber impacts with all of the domains in Multi-Domain Operations (MDO) and thereby enhances mission effectiveness by improving decision cycles. Work in this Project complements PE 0602146A (Network C3I Technology) / Project AQ7 (High Tempo Data Driven Decision Tools).

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

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

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** High Tempo Data Driven Decision Tools Advanced Technology | - | - | 3.022 |
| ***Description:*** This effort matures and demonstrates data driven decision tools tailored to reflect specific mission / information needs of the commander and individual staff members comprised of the following: Software that facilitates the exchange of cyber data and mission information between the cyber electronicmagnetic activities (CEMA) cell, the S-6 and other staff officers (S-3, S-2, Fire Support Officier (FSO)), helping to assess higher-level impacts of lower-level events, and capturing the information as part of models for possible re-use; and software that dynamically populates the common operating picture (COP) with visualizations designed for exploration and understanding of the impact of the cyber domain on the current mission.<br><br>***FY 2021 Plans:***<br>Using vignettes, will demonstrate S-6 / S-3 / Commander perspectives and collaboration that show improved cyber situational understanding (SU); and demonstrate that the model/cyber impact tool dynamically updates the Common Operating Picture.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort starts in FY2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 3.022 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AQ8 / *High Tempo Data Driven Decision Tools Adv Tech* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AR2 / *Energy Informed Operations Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AR2: *Energy Informed Operations Advanced Technology* | - | 0.000 | 1.944 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.944 |

**Note**

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology
* Project 101 Tactical Command and Control

In Fiscal Year 2021 (FY21) this Project is realigned to:
PE 0603465A Future Vertical Lift Advanced Technology
* Project AM5 Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates software, algorithms, communication and control methodologies that allow more expedient, efficient, and informed use of energy resources across the battlefield. It provides Commanders at all echelons with situational awareness (SA) that allows them to understand and control their power and energy resources to ensure continuous operations of mission equipment and maintain overmatch of adversaries.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Expeditionary Energy Informed Operations | - | 1.856 | - |
| ***Description:*** This effort matures and demonstrates advanced power and thermal management and distribution technologies for command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) applications as well as validates and integrates designs in power generation, hybrid energy storage, and assessments. | | | |
| ***FY 2020 Plans:***<br>Demonstrate and validate intelligent power system technologies at user events targeting Multi-Domain Operations and joint applications; develop and demonstrate predictive power and use algorithms in multi-power source configurations in support of ad- | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AR2 / *Energy Informed Operations Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| hoc, mobile arrangements of power equipment for expeditionary Command, Control, Communications, computers, Intelligence, Surveillance and Reconnaissance (C4ISR) systems; demonstrate multiple-master control methodologies in intelligent power systems integrated into C4ISR platforms like vehicles, airframes or other platforms with critical power loads that must join together in an ad-hoc power network with competing prioritizations; and validate and demonstrate universal translation and mixed grid control capabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This funding was realigned to PE 0603465A/Project New Start (AM5) Opt Energy Storage & Thermal Management for FVL Survivability | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.088 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.944 | - |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AR4 / *Intelligent Env Battlefield Awareness Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AR4: *Intelligent Env Battlefield Awareness Adv Tech* | - | 0.000 | 0.641 | 3.257 | - | 3.257 | 4.125 | 4.184 | 5.201 | 7.334 | 0.000 | 24.742 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603728A Environmental Quality Technology Demonstrations, Project:
* 03E Environmental Restoration Technology

**A. Mission Description and Budget Item Justification**

This Project demonstrates and optimizes technologies to allow Soldiers to maneuver faster around or through existing environmental (urban/industrial) conditions and physical landscape constraints. This effort matures and demonstrates web modules/software tools delivering crucial geo-chemical resources and advanced knowledge of geo-environmental infrastructure to mission planners.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Geo-Forensics for Reconnaissance Exploitation | - | 0.641 | 1.560 |
| ***Description:*** This effort provides unique terrestrial patterns to describe and predict the geological, biological, and overall ecological information associated with A2/AD sites from CONUS analogs. | | | |
| ***FY 2020 Plans:***<br>Develop of a software tool that predicts soil behavior, including ability to retain or alter chemical threats, at locations where access and knowledge are limited; and mature and demonstrate tools to allow incorporating this data onto geospatial maps to enable mission planning and forensics applications for predicting chemical movement in the soil. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AR4 / *Intelligent Env Battlefield Awareness Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will demonstrate a software tool to predict soil behavior and its impact to Army maneuver and mobility that will be represented on a geospatial map to be used for mission planning; and mature prediction algorithms of ice structure, permafrost, and freeze/thaw events for sub-Arctic and Arctic terrain across seasons.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program increase. | | | |
| ***Title:*** Arctic Threat Demonstrations<br>***Description:*** This effort matures and demonstrates visualization tools which enable geospatial decisions based on anticipated physical threats, hazards and dependencies posed by terrain and weather extremes in cold regions.<br>***FY 2021 Plans:***<br>Will integrate sophisticated weather models into high resolution remotely sensed terrain for a platform of terrain state changes such as freeze/thaw, snowmelt, and ice vulnerability to aid in preventing risks to operational effectiveness and efficiency in cold regions.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This Effort begins FY 2021. | - | - | 1.697 |
| **Accomplishments/Planned Programs Subtotals** | - | 0.641 | 3.257 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AR6 / *Understanding the Environment as a Threat Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AR6: *Understanding the Environment as a Threat Adv Tech* | - | 0.000 | 2.245 | 2.809 | - | 2.809 | 2.555 | 3.301 | 3.656 | 4.636 | 0.000 | 19.202 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603728A Environmental Quality Technology Demonstrations, Project:
* 03E Environmental Restoration Technology

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates tools that provide capability to inform the Solider of different routes through a complex urban landscape. Optimizes tools that balance exposure to environmental threats with mission constraints to provide a risk versus reward capability of operating in different areas of the urban theater. This Project matures and demonstrates predictive software accurately integrating the risks of physical, chemical, and biological threats in an urban environment into route planning tools.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the Engineer Research and Development Center.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Environmental Threat Technology Demonstrations for route planning | - | 2.201 | 1.409 |
| ***Description:*** This effort matures and demonstrates a software tool informing and balancing the risk of exposure to environmental threats with maneuver constraints along potential routes. The software integrates the risks associated with different environmental matrices in complex urban environments and includes the capability for routing in off-road scenarios. | | | |
| ***FY 2020 Plans:***<br>Demonstrate a new route planning capability for off-road options through the complex urban environment; and mature and optimize products that will inform the Soldier of risks to personnel and equipment expected along various routes, to weigh Soldier exposure and probability of mission success. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AR6 / *Understanding the Environment as a Threat Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will demonstrate threat overlays to synergize battlefield intelligence modules with visualized threats and course forecasting; and provide an interactive simulation environment to evaluate tool performance in urban theaters.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program decrease. | | | |
| ***Title:*** Hazard Prediction Demonstration<br>***Description:*** This effort matures and demonstrates a mission planning platform that provides Soldiers with a predictive visualization technology to identify, track and plan for industrial or commercial chemical/environmental threats in operational environments.<br>***FY 2021 Plans:***<br>Will mature predictive software algorithms that integrate air and/or spill releases with water, soil, infrastructures, and sub-terrain domains for immediate and persistent risk assessments; and demonstrate threat overlays to synergize battlefield intelligence and visualize threats across multiple domains (i.e., air, water, soil).<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort begins in FY2021. | - | - | 1.400 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.044 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 2.245 | 2.809 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AR8 / *Sensing in Contested Environments Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AR8: *Sensing in Contested Environments Adv Tech* | - | 0.000 | 0.000 | 0.983 | - | 0.983 | 1.631 | 1.798 | 1.818 | 2.814 | 0.000 | 9.044 |

**Note**

This is a new start in FY2021.

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates advanced sensor technologies that characterize hazards posed to warfighters by non-weaponized biological hazards in subterranean environments. Demonstrations of adaptive commercial off the shelf sensor technologies on existing UGV platforms to gather end-user feedback.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Non-Traditional Threat Detection Advance Technology | - | - | 0.983 |
| ***Description:*** This effort matures and demonstrates combined commercial off the shelf capabilities from multiple sources as an integrated robotic-operable expeditionary kit for accurate detection of biological hazards for early warning in subterranean environments from point of ingress/egress prior to exposure.<br><br>***FY 2021 Plans:***<br>Will validate candidate sensor technologies for maturity and effectiveness and demonstrate scenarios to detect and characterize of chemical hazards including water quality, heavy metals in soils, air quality, and non-weaponized radiological hazards.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Realigned to accelerate in support of Modernization Priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 0.983 |

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

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AR8 / *Sensing in Contested Environments Adv Tech* |

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

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AS9 / *Persistent Geophysical Sensing-Infrasound Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AS9: *Persistent Geophysical Sensing-Infrasound Adv Tech* | - | 0.000 | 2.511 | 4.774 | - | 4.774 | 2.479 | 2.281 | 2.553 | 2.776 | 0.000 | 17.374 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

**A. Mission Description and Budget Item Justification**

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

All FY20 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project conducted at U.S. Army Engineer Research and Development Center.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Remote Assessment of Infrastructure for Ensured Maneuver (RAFTER) Demonstrations | - | 2.397 | 4.774 |
| ***Description:*** This effort matures and demonstrates a light-weight, low-power, persistent monitoring system that is capable of integration with mission command platforms with associated software for processing geophysical data in near-real-time (with no SME in the loop) to provide actionable intelligence concerning critical transportation assets. This effort complements PE 0602146A (Network C3I Technology) / Project AR9 (Persistent Geophysical Sensing-Infrasound Tech). | | | |
| ***FY 2020 Plans:***<br>Optimize and validate the persistent monitoring system and associated software for near-real-time geophysical data processing through multiple field demonstrations. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AS9 / *Persistent Geophysical Sensing-Infrasound Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will mature and demonstrate autonomous geophysical data processing and alerts for decision making using the persistent monitoring system and software in the battlespace; and mature and demonstrate the next generation sensors as part of the autonomous geophysical data processing and alerts for decision making.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program increase. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.114 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 2.511 | 4.774 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AT3 / *Subterranean Detection and Monitoring Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT3: *Subterranean Detection and Monitoring Adv Tech* | - | 0.000 | 1.059 | 3.488 | - | 3.488 | 2.245 | 0.000 | 1.233 | 1.384 | 0.000 | 9.409 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

**A. Mission Description and Budget Item Justification**

This Project validates and demonstrates advanced subterranean monitoring and vulnerability assessment technologies providing mobile and man-portable solutions to enhance survivability and threat awareness during urban operations and negate enemy subterranean operation advantage. This Project also optimizes and demonstrates enhanced technologies to detect tunnels and tunneling activity in complex and varied environments.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project conducted at U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Subterranean Threat Assessment by Real-time Sensing Demonstrations | - | 1.011 | 3.488 |
| ***Description:*** This effort validates and demonstrates integrated suite of tunnel detection and persistent surveillance technologies, mobile and man-portable solutions to detect underground municipal infrastructure, voids, and other subterranean vulnerabilities in urban and complex domains. This effort complements PE 0602146A (Network C3I Technology) / Project AT2 (Subterranean Detection and Monitoring Technology). | | | |
| ***FY 2020 Plans:***<br>Optimize seismic acquisition hardware and software components to speed up data acquisition and transfer rates, validate sensor coupling models, and demonstrate full waveform inversion data processing algorithms. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AT3 / *Subterranean Detection and Monitoring Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will validate passive sensor algorithms and sensor installation methods in variable geo-materials; and demonstrate the EMI electromagnetic induction (EMI) transmitter at a live experiment in an appropriate operational environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program increase. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.048 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.059 | 3.488 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AT8 / *Network-Enabled GeoSpatial-GEOINT Services AdvTech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT8: *Network-Enabled GeoSpatial-GEOINT Services AdvTech* | - | 0.000 | 3.880 | 2.997 | - | 2.997 | 3.097 | 4.522 | 0.000 | 0.000 | 0.000 | 14.496 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

**A. Mission Description and Budget Item Justification**

This Project integrates and demonstrates the geo-registration, feature extraction, change detection, data visualization and transmission capabilities developed in the applied research portion of this effort. Tools developed for the exploitation of 3D datasets will be integrated into a streamlined workflow requiring low levels of expertise, putting advanced processing capabilities in the hands of the Soldier. This effort includes demonstrations of tactical enhancements and the integrated ability to rapidly share mission critical 3D information in support of planning and execution.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.
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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** 3D Terrain Automated Geospatical Co-Registration and Change Detection (Previously: Integration & Demonstration of 3D Data Model Feature Extraction, Geo-registration, Analytical Tool Development & Vis) | - | 3.703 | 2.997 |
| ***Description:*** This effort matures, integrates and demonstrates the design and formulation of new urban terrain data models, frameworks and processes to automate the transformation of tactical unit generated source data (e.g. LiDAR, imagery, and full motion video derived data) to new model constructs for rapid and accurate geo-registration of features (manmade infrastructure). | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AT8 / *Network-Enabled GeoSpatial-GEOINT Services AdvTech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Review, compare, and document through experiments and demonstrations baseline of industry and government technologies in 3D data processing, and data models, in terms of adaptation to modernization of mission command network; and compare suitability for automated feature extraction and resources required for accurate Geo-registration and display.<br>***FY 2021 Plans:***<br>Will demonstrate in a high fidelity laboratory environment successful co-registration of disparate sources of field generated 3D geospatial data for incorporating into the tactical foundation layer terrain dataset.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding change reflects planned life cycle of this effort | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.177 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 3.880 | 2.997 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AU1 / *Tactical GeoSpatial Information Capabilities ATech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AU1: *Tactical GeoSpatial Information Capabilities ATech* | - | 0.000 | 2.012 | 3.740 | - | 3.740 | 4.259 | 5.860 | 0.000 | 0.000 | 0.000 | 15.871 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates next generation geospatial analytical tools for 3D complex environments applicable to low echelon and tactical edge exploitation. These new capabilities will allow deployed units to enhance/update provisioned (baseline) standard, sharable, geospatial foundation (SSGF) data through automated analytics on multi-sourced spatial data resulting in streamlined, high fidelity terrain analysis products. Reducing data gaps and processing timelines will greatly increase Soldier situational awareness and support faster decision making in complex terrain.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** 3D Terrain Analysis | - | 1.246 | 3.181 |
| ***Description:*** This effort integrates and demonstrates software models and workflows provisioned on the geospatial and GEOINT workstations for improved capabilities to generate, process and exploit terrain products enabling situational awareness and rapid decision making at the tactical edge. | | | |
| ***FY 2020 Plans:***<br>Conduct testing of preliminary compatible framework and workflow for remotely sensed tactical data exploitation that provisions an enhanced terrain analysis capability to the geospatial engineer toolkit. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU1 / *Tactical GeoSpatial Information Capabilities ATech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will develop and demonstrate enhanced terrain processing for generating a high resolution foundation feature layers providing enhanced situational awareness through new tactical terrain products supporting the Distributed Common Ground Station - Army.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding change reflects planned life style of this effort. | | | |
| ***Title:*** Previously Advanced Airborne LiDAR<br>***Description:*** This effort integrates and demonstrates enhanced Geiger-mode LiDAR hardware/software, for advanced testing of protocols, equipment, and products for enhanced high-altitude/wide area terrain data collection, to support tactical operations.<br>***FY 2020 Plans:***<br>Mature new Geiger-mode LiDAR sensor payload components, for increasing performance and speed of collection and processing, for more realistic portrayal of multi-domain environments.<br>***FY 2021 Plans:***<br>Will demonstrate (through analysis of FY2020 flight campaign results) a performance assessment of various hardware components (laser, scanner, and detector) being matured to reduce risk for airborne LIDAR prototypes.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned program decrease. | - | 0.675 | 0.559 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.091 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 2.012 | 3.740 |

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

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU1 / *Tactical GeoSpatial Information Capabilities ATech* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AU2 / *Optimization of Geospatial Data for Visualization* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AU2: *Optimization of Geospatial Data for Visualization* | - | 0.000 | 0.000 | 2.098 | - | 2.098 | 2.198 | 1.798 | 1.782 | 1.800 | 0.000 | 9.676 |

**Note**

This Project is a new start in Fiscal Year (FY) 2021.

**A. Mission Description and Budget Item Justification**

This Project develops and demonstrates new open source software defined data models, and establishes an architecture to provide correct (mission context) geospatial content to the end-user consistent with device, tactical assessment/need, available bandwidth, and user movement. Advanced software and processes will reduce file size and network requirements, enabling near real-time updates to Soldiers. Resulting 3D foundation data and associated accuracy information will enable position and navigation determination, through analysis with a variety of Soldier and vehicle borne sensors.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Optimization of Geospatial Data for Tactical Visualization-Demonstration | - | - | 2.098 |
| ***Description:*** This effort matures and demonstrates new open source software, data models and processes to generate a vision-based geospatial foundation layer to enable end-users systems to visualize real-time mission critical geospatial content at the required level-of-detail (LOD) and enable position-navigation self-localization capability applicable to end-user devices at required accuracies optimized for the device, application, and mission.<br><br>***FY 2021 Plans:***<br>Will mature and demonstrate full motion video (FMV) to 3D data processing algorithm achieving geometric accuracy of terrain and infrastructure for integration into the tactical unit's geospatial foundation layer.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort starts in FY2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 2.098 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU2 / *Optimization of Geospatial Data for Visualization* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AU4 / *Geospatially Enabled Operational Design Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AU4: *Geospatially Enabled Operational Design Adv Tech* | - | 0.000 | 4.819 | 8.205 | - | 8.205 | 8.054 | 7.663 | 0.000 | 0.000 | 0.000 | 28.741 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

**A. Mission Description and Budget Item Justification**

This Project demonstrates, integrates and transitions to the Army Command Post Computing Environment, a geospatially enabled collaborative planning environment, accessible across echelons, with capabilities that support Army Design Methodology (ADM) by providing the ability to perform conceptual planning and problem framing, supporting a greater understanding and visualization of the dynamic operational environment, a shared understanding of the operations purpose across echelons, and enhanced products to drive detailed budget planning and operational assessment processes, enhancing the collaborative interaction between commanders, staffs, and unified action partners.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Geospatially Operational Design (GEOD) - Demonstration (Previously Virtual Collaborative Operational Design Demonstrations) | - | 2.325 | 8.205 |
| ***Description:*** This effort integrates and demonstrates automation technologies to digitally visualize, create and assess critical elements of the Operational Environment required to inform the Operational Design functions, including collaborative conceptual framing of the problem. | | | |
| ***FY 2020 Plans:***<br>Design and demonstrate tools to support Army Design Methodology (ADM) to frame the problem and visualize the desired end state in a geospatial context. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU4 / *Geospatially Enabled Operational Design Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will mature and demonstrate analytics and tools for framing an operational environment (OE), facilitating models that represent the current conditions of the OE (current state) and models that represent what the OE should resemble (represent) at the conclusion of an operation (desired end state); and demonstrate a suite of automated data aggregation, analysis and visualization algorithms that perform operational assessments to compare planning criteria against current estimates enabling continuous updates of planning staff running estimates.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Planned effort increase that will mature and demonstrate analytics and tools for framing an operational environment. | | | |
| ***Title:*** Tactical Data Analysis and Visualization Demonstration<br>***Description:*** This effort integrates and demonstrates a suite of automated data aggregation analysis and visualization capabilities allowing commanders and staffs the capability to bridge conceptual planning (ADM) to deliberate planning at echelons down to battalion.<br>***FY 2020 Plans:***<br>Design and conduct demonstrations to geospatially enable strategic guidance inputs to operational design, in a digital, integrated, collaborative planning environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This Effort transitions in FY 2021. | - | 2.485 | - |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.009 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 4.819 | 8.205 |

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

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU4 / *Geospatially Enabled Operational Design Adv Tech* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AU6 / *Automated Analytics for Operational Environment AT* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AU6: *Automated Analytics for Operational Environment AT* | - | 0.000 | 1.661 | 0.000 | - | 0.000 | 0.000 | 0.000 | 2.278 | 2.278 | 0.000 | 6.217 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

In FY2021, this research in this Project is realigned to:
PE 0602146A Network C3I Technology, Project:
AT7 Network Enabled Geospatial - GEOINT Services

**A. Mission Description and Budget Item Justification**

This Project demonstrates advanced technologies to understand and visualize threat patterns and operational environment changes and support mission planning by contextualizing results based on battlefield conditions and on hidden patterns discovered and merged from textual reporting. Work supports the Common Operating Environment LOE.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Simultaneous Multi-Domain Data Representation | - | 0.562 | - |
| ***Description:*** This effort demonstrates advanced capabilities to provide commanders and staffs with the ability to understand and operate in multiple domains simultaneously, utilizing data representations and algorithms to seamlessly track the enemy, determine patterns of behavior or actions, identify operational environment changes, and support mission planning by contextualizing results from textual data analysis based upon battlefield conditions. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AU6 / *Automated Analytics for Operational Environment AT* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Exploit available advanced spatio-temporally coherent multi-domain data representations that capture explicit and implicit relationships between threat actors, and operational environment changes, distilled from raw data.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Realignment to 0602146A Network C3I Technology /AT7 Network Enabled Geospatial - GEOINT Services for work in Optimization of Geospatial Data for Tactical Visualization. | | | |
| ***Title:*** Automated Analysis of Multi-Domain Data<br>***Description:*** This effort demonstrates data models to support automated sense making and analysis and advanced relevancy ranking approaches to identify and prioritize knowledge gaps and contextualized results.<br>***FY 2020 Plans:***<br>Exploit available multi-domain data fusion capabilities for geospatial data processing, analytics and representations.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Realignment to 0602146A Network C3I Technology /AT7 Network Enabled Geospatial - GEOINT Services for work in Optimization of Geospatial Data for Tactical Visualization. | - | 1.024 | - |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.075 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.661 | - |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AV1 / *GEOInt/Ops Logistics Integration-Planning Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AV1: *GEOInt/Ops Logistics Integration-Planning Adv Tech* | - | 0.000 | 0.000 | 3.914 | - | 3.914 | 3.915 | 2.897 | 4.948 | 4.948 | 0.000 | 20.622 |

**Note**

This is a new start in FY2021.

This new Project starts in Fiscal Year (FY) 2021

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates a suite of analytical and visualization tools designed to facilitate analysis of courses of action (COAs) through modeling and simulation (M&S) and wargames to support development of alternate COAs and approval of the operational plan (OPLAN). This Project will integrate existing M&S and wargaming applications (One Semi-Automated Forces; Infantry Warrior Simulation ; Logistics Composite Model ), to assess multiple courses of action to be analyzed in a multi-domain environment.

The cited 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 Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Integration of intel and logistics Multi Echelon Planning | - | - | 3.914 |
| ***Description:*** This effort demonstrates a suite of analytical and visualization tools designed to facilitate analysis of multiple courses of action through M&S and wargames to support development of alternate COAs and approval of the operational plan.<br><br>***FY 2021 Plans:***<br>Will optimize application programming interfaces (APIs) that allow automated ingestion of data into M&S and war-game applications and then back into mission planning software.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort starts in FY2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 3.914 |

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

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AV1 / *GEOInt/Ops Logistics Integration-Planning Adv Tech* |

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

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AV2 / *LEO Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AV2: *LEO Advanced Technology* | - | 0.000 | 1.927 | 1.979 | - | 1.979 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.906 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603006A Space Application Advanced Technology, Project:
* 592 Space Application Tech

**A. Mission Description and Budget Item Justification**

Project AV2 will mature Low Earth Orbit (LEO) constellation management for space order-of-battle architectures and protocols. The advanced technology development will involve using two spacecraft and will leverage commercial LEO mega-constellation investments to develop capabilities which support direct sensor-to-shooter data links while under control by a maneuver battalion commander. Technology will be optimized to enable communications and deep strikes in contested environments. This Project supports the Army's efforts to proliferate and control space assets to support the tactical ground commander. It includes exploration efforts to augment missile warning, GPS, and global communications.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

The work cited 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 US Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) Technical Center in Huntsville, AL and the Defense Advanced Research Projects Agency (DARPA), Arlington, VA.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Payload Technology Development | - | 1.886 | 1.979 |
| ***Description:*** Mature the technology for Low Earth Orbit satellites. Payload integration will be validated as well as the architectureand design of two LEO satellites for support to an Army tactical commander.<br><br>The work cited is consistent with the Under Secretary of Defense for Research and Engineering Science and Technology (S&T) priority focus areas and the Army Modernization Strategy.<br><br>This work is performed by the Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT) in Huntsville, AL. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AV2 / *LEO Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Design and develop space payloads to operate in a LEO constellation and augment missile warning/defense, GPS, and provide global communications with tactical timelines.<br>***FY 2021 Plans:***<br>Will mature LEO constellation management technologies.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding change reflects planned life cycle of this effort | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.041 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 1.927 | 1.979 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AV4 / *Foundational S&T for Network C3I Advanced Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AV4: *Foundational S&T for Network C3I Advanced Tech* | - | 0.000 | 0.000 | 2.126 | - | 2.126 | 2.646 | 2.859 | 2.949 | 2.949 | 0.000 | 13.529 |

**Note**

In Fiscal Year (FY) 2020, this project is realigned from PE 0603772A / Advanced Tactical Computer Science and Sensor Technology.

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates underlying technologies applicable to artificial intelligent agents and holistic network integration as applied to, but not limited to autonomous manned-unmanned teaming for ground and air platforms. This Project also matures and demonstrates emerging research leading to potential technology development in areas of strategic importance to the Army in network technologies, by bringing competitively selected Universities with research teams into Technical Alliances.

The cited 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 Army Futures Command (AFC).

This work is done in coordination with PE 0602146A (Network C3I Technology).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Demonstration of emerging technologies for holistic network integration | - | - | 2.126 |
| ***Description:*** This Project matures and demonstrates underlying technologies applicable to next generation networks and integration of the same.<br><br>***FY 2021 Plans:***<br>Will mature and demonstrate emerging technologies from the sister 6.2 effort focusing on Autonomy, Artificial intelligence/Machine Learning as applicable to, but not limited to, holistic network integration; and investigate Autonomy-related machine learning technologies, advanced teaming, and navigation/routing necessary for the Ground and Air platforms in support of the Army Modernization Priorities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding increase due to realignment from PE 0603772A / Advanced Tactical Computer Science and Sensor Technology. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 2.126 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AV4 / *Foundational S&T for Network C3I Advanced Tech* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AV8 / *Navigation Warfare (NAVWAR) Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AV8: *Navigation Warfare (NAVWAR) Advanced Technology* | - | 0.000 | 5.118 | 2.535 | - | 2.535 | 2.044 | 1.998 | 5.968 | 5.968 | 0.000 | 23.631 |

**Note**

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology, Project:
* 101 Tactical Command and Control

**A. Mission Description and Budget Item Justification**

This Project matures and demonstrates capabilities allowing the Army to monitor, understand, and control the Navigation Warfare (NAVWAR) environment. This requires an integrated approach to Electronic Protection (EP), Electronic Support (ES), and Electronic Attack (EA) to rapidly characterize the NAVWAR environment, deny Positioning, Navigation, and Timing (PNT) based capabilities to our adversaries, and maintain Army capabilities.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** NAVWAR for Ground Soldiers | - | 4.886 | - |
| ***Description:*** This effort matures and demonstrates capabilities allowing the Army to monitor, understand, and control the NAVWAR environment. This requires an integrated approach to Electronic Protection (EP), Electronic Support (ES), and Electronic Attack (EA) to rapidly characterize the NAVWAR environment, deny PNT based capabilities to our adversaries, and maintain Army capabilities. | | | |
| ***FY 2020 Plans:***<br>Improve the performance of a Navigation Warfare (NAVWAR) breadboard that will enable continued military operations in hostile, GPS denied environments by integrating electronic attack, electronic protection and electronic support hardware and software; incorporate the new Military Code (M-Code) GPS signal for offensive and defensive NAVWAR operations into the breadboard; mature and code a PNT situational awareness software tool utilizing existing sensors and GPS receivers; mature and demonstrate a hardware solution using multi-GNSS signals for integrity monitoring; will integrate PNT technologies such as radio | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AV8 / *Navigation Warfare (NAVWAR) Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| frequency (RF) ranging beacons for in-building navigation to augment PNT solutions for mounted and dismounted platforms; and mature and demonstrate two way time transfer hardware that will provide accurate time to users and systems in the absence of GPS.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Effort completes in FY20. | | | |
| ***Title:*** PNT Situational Awareness (SA) Advanced Technology<br>***Description:*** This effort demonstrates real time PNT Situational Awareness for a Common Operating Picture (COP) on selected Computing Environment (CE); improves fusion algorithms for at least two types of PNT SA sensors (terrestrial, air, space); generates an Interface Control Document (ICD) for PNT SA messages; allow open integration and reference implementation for PNT SA stored data for distribution on various platforms.<br>***FY 2021 Plans:***<br>Will select and demonstrate simulated aggregation of multi-domain sensor data into Computing Environment; improve current emitter characterization techniques/algorithms, and optimize data fusion software.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>New research effort. | - | - | 2.535 |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.232 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 5.118 | 2.535 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AW2 / *Autonomous Navigation Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AW2: *Autonomous Navigation Advanced Technology* | - | 0.000 | 0.292 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.292 |

**Note**

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology
* Project 101 Tactical Command and Control

In FY2021, this Project is eliminated. Funding is realigned to PE 0603463A Network C3I Advanced Technology, Project AW6 Modular GPS Independent Sensors Advanced Technology.

**A. Mission Description and Budget Item Justification**

This Project will leverage Assured Positioning, Navigation, and Timing (PNT) efforts. It improves localization and decision making of Robotic/Autonomous Systems by optimizing use of sensors on the platform and taking advantage of all available navigation signals.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Autonomous Navigation | - | 0.278 | - |
| ***Description:*** This effort leverages Assured PNT efforts and improves localization and decision making of Robotic/Autonomous Systems by optimizing use of sensors on the platform and taking advantage of all available navigation signals. Work accomplished under Program Element (PE) 0602146/Project AW1 (Autonomous Navigation Technology) complements this effort. | | | |
| ***FY 2020 Plans:***<br>Perform a candidate component demonstration on a Mounted platform for Assured Autonomous PNT, leveraging previous sensor and component work integrated with autonomous obstacle avoidance sensors (potential sensors include inertial measurement units, vision navigation sensors, RF ranging, etc.). | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

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|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AW2 / *Autonomous Navigation Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| In FY2021, Project is eliminated and funding realigned to PE 0603463A Network C3I Advanced Technology / Project AW6 Modular GPS Independent Sensors Adv Tech in support of Soldier Integrated PNT. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.014 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 0.292 | - |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AW4 / *DoD PNT M&S Collaborative Initiative (CI) Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AW4: *DoD PNT M&S Collaborative Initiative (CI) Adv Tech* | - | 0.000 | 2.916 | 2.997 | - | 2.997 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.913 |

**Note**

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology, Project:
* 101 Tactical Command and Control

**A. Mission Description and Budget Item Justification**

This Project matures, demonstrates and performs modeling and simulation (M&S) of Positioning, Navigation, and Timing (PNT) technologies to provide access to trusted PNT information in global positioning system (GPS) denied or degraded environments.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command (AFC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** DoD PNT M&S Collaborative Initiative (CI) | - | 2.784 | 2.997 |
| ***Description:*** This effort matures, demonstrates and performs modeling and simulation (M&S) of PNT technologies to provide access to trusted PNT information in global positioning system (GPS) denied or degraded environments. Work accomplished under Program Element (PE) 0602146/Project AW3 (DoD PNT M&S Collaborative Initiative (CI) Technology) complements this effort. | | | |
| ***FY 2020 Plans:***<br>Conduct operational Tri-Service PNT M&S Analysis for a more comprehensive analysis of PNT in the battlespace; adopt and adapt operational mission/campaign level simulations; and demonstrate a PNT M&S capability in performing force effectiveness analysis of candidate PNT technologies. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AW4 / *DoD PNT M&S Collaborative Initiative (CI) Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Will conduct a final demonstration of the matured system to Tri-Service Stakeholders of a PNT M&S capability performing force effectiveness analysis of candidate PNT technologies. This demonstration will document how the candidate PNT Technologies impacted operational mission effectiveness in a specific scenario.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Nominal planned change of scope. | | | |
| ***Title:*** FY 2020 SBIR/STTR Transfer<br>***Description:*** Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 Plans:***<br>Funding transferred in accordance with Title 15 USC ?638<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transferred in accordance with Title 15 USC ?638 | - | 0.132 | - |
| **Accomplishments/Planned Programs Subtotals** | - | 2.916 | 2.997 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | Project (Number/Name)<br>AW6 / *Modular GPS Independent Sensors Advanced Tech* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AW6: *Modular GPS Independent Sensors Advanced Tech* | - | 0.000 | 0.000 | 11.089 | - | 11.089 | 10.490 | 9.995 | 12.089 | 14.388 | 0.000 | 58.051 |

**Note**

This is a New Start in Fiscal Year 2021 (FY21)

**A. Mission Description and Budget Item Justification**

This project matures and demonstrates a resilient, soldier-integrated precision navigation and timing solution, providing precision geolocation, geospatial survey information, global positioning system (GPS) spoofing awareness and countermeasures to dismounted warfighters in GPS-denied/degraded environments.

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

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

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Soldier-Integrated PNT | - | - | 11.089 |
| ***Description:*** This effort implements a standards-based, open Positioning, Navigation, and Timing (PNT) architecture solution for rapid commercial of the shelf (COTS) and emerging technology integration; incorporates artificial intelligence approaches to aggregate multiple organic and networked sensor inputs for improved PNT accuracy and reliability; demonstrates Simultaneous Localization and Mapping (SLAM) based-algorithms incorporating alternative PNT inputs; and demonstrates alternative PNT sensors and approaches, including radio frequency time differencing, signals of opportunity, inertial, gravimetric, and imagery.<br><br>***FY 2021 Plans:***<br>Will validate initial Soldier-Integrated PNT technologies based on an open architecture that incorporates multiple sensors and algorithmic approaches; validate and optimize multiple types of alternative PNT sensors sourced through a technology discovery process; optimize a modular, open PNT sensor fusion architecture and algorithm optimization for dismounted soldiers; and integrate and demonstrate modular Soldier-Integrated-PNT technologies and initial interfacing with a soldier form factor display device.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase in order to validate initial Soldier-Integrated PNT technologies based on an open architecture that incorporates multiple sensors and algorithmic approaches, and to validate and optimize multiple types of alternative PNT sensors. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 11.089 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>AW6 / *Modular GPS Independent Sensors Advanced Tech* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603463A / *Network C3I Advanced Technology* | | | | Project (Number/Name)<br>BP4 / *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| BP4: *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)* | - | 0.000 | 39.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 39.000 |

**Note**

Congressional Interest Item funding provided for Electronic Warfare Advanced Technologies.

**A. Mission Description and Budget Item Justification**

Congressional Interest Item funding provided for Electronic Warfare Advanced Technologies.

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

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Unmanned Aerial Systems and Aerostat Operations<br>***FY 2020 Plans:*** Unmanned Aerial Systems and Aerostat Operations | - | 4.000 |
| ***Congressional Add:*** Sensor Advanced Technology<br>***FY 2020 Plans:*** Sensor Advanced Technology | - | 10.000 |
| ***Congressional Add:*** Assured Position, Navigation, and Timing<br>***FY 2020 Plans:*** Assured Position, Navigation, and Timing | - | 9.000 |
| ***Congressional Add:*** Payload and Ground Segment Research and Development for Small Satellite Science and Security Applications<br>***FY 2020 Plans:*** Payload and Ground Segment Research and Development for Small Satellite Science and Security Applications | - | 5.000 |
| ***Congressional Add:*** Urban Subterranean Mapping Technology<br>***FY 2020 Plans:*** Urban Subterranean Mapping Technology | - | 3.000 |
| ***Congressional Add:*** Anticipating Threats to Natural Systems<br>***FY 2020 Plans:*** Anticipating Threats to Natural Systems | - | 6.000 |
| ***Congressional Add:*** Army Visual and Tactical Arctic Reconnaissance | - | 2.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Army | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603463A / *Network C3I Advanced Technology* | **Project (Number/Name)**<br>BP4 / *ELECTRONIC WARFARE ADVANCED TECHNOLOGIES (CA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2020 Plans:*** Army Visual and Tactical Arctic Reconnaissance | | |
| **Congressional Adds Subtotals** | - | 39.000 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A