| Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army | | | | | | | | | | | Date: March 2024 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 0603042A *I C3I Advanced Technology* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2023** | **FY 2024** | **FY 2025 Base** | **FY 2025 OCO** | **FY 2025 Total** | **FY 2026** | **FY 2027** | **FY 2028** | **FY 2029** | **Cost To Complete** | **Total Cost** |
| Total Program Element | - | 12.252 | 19.225 | 22.814 | - | 22.814 | 20.327 | 18.801 | 19.198 | 21.583 | 0.000 | 134.200 |
| CN3: *Network Enabling University Adv Development* | - | 3.847 | 4.031 | 3.932 | - | 3.932 | 3.594 | 3.597 | 3.636 | 3.672 | 0.000 | 26.309 |
| CX7: *Intelligent Env Battlefield Awareness Adv Tech* | - | 4.713 | 6.396 | 7.968 | - | 7.968 | 7.724 | 3.545 | 1.883 | 2.889 | 0.000 | 35.118 |
| CX8: *Persistent Geophysical Sensing-Infrasound Adv Tech* | - | 2.249 | 2.635 | 3.137 | - | 3.137 | 2.085 | 2.611 | 2.994 | 3.167 | 0.000 | 18.878 |
| CX9: *Sensing in Contested Environments Adv Technologies* | - | 1.043 | 1.104 | 2.083 | - | 2.083 | 0.151 | 0.459 | 2.989 | 3.019 | 0.000 | 10.848 |
| CZ5: *Subterranean Detection and Monitoring Adv Tech* | - | 0.400 | 1.272 | 1.432 | - | 1.432 | 1.834 | 2.328 | 0.862 | 1.388 | 0.000 | 9.516 |
| DB5: *Enabling Long Standoff 3D (ELS3D) Adv Tech* | - | - | 1.045 | 1.502 | - | 1.502 | 2.593 | 4.931 | 5.490 | 6.091 | 0.000 | 21.652 |
| DE7: *Understanding Environment as a Threat Adv Tech* | - | - | 2.742 | 1.433 | - | 1.433 | 1.017 | - | - | - | 0.000 | 5.192 |
| DI6: *Anti-Tamper Advanced Tech Development* | - | - | - | 1.327 | - | 1.327 | 1.329 | 1.330 | 1.344 | 1.357 | 0.000 | 6.687 |

**Note**

Project DI6 (Anti-Tamper Advanced Tech Development) is a new start within PE 0603042A (C3I Advanced Technology) in FY 2025. Funding for DI6 (Anti-Tamper Advanced Tech Development) transitioned from PE 0602146A (Network C3I Technology) / AV5 (Protective Technologies) to support maturation to Technology Readiness Level 6 (TRL6) and transition of anti-tamper technologies into DoD and Army weapons systems.

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

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

support capabilities such as situational awareness. These efforts directly inform and transition key capabilities to Army programs of record that support the Army modernization priorities.

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

| B. Program Change Summary ($ in Millions) | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 12.716 | 19.225 | 23.223 | - | 23.223 |
| Current President's Budget | 12.252 | 19.225 | 22.814 | - | 22.814 |
| Total Adjustments | -0.464 | 0.000 | -0.409 | - | -0.409 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.002 | - | | | |
| • SBIR/STTR Transfer | -0.466 | - | | | |
| • Adjustments to Budget Years | - | - | -0.409 | - | -0.409 |

**Change Summary Explanation**

Funding change reflects realignment of funding priorities within Army's Science and Technology (S&T) network portfolio.

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>CN3 / *Network Enabling University Adv Development* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN3: *Network Enabling University Adv Development* | - | 3.847 | 4.031 | 3.932 | - | 3.932 | 3.594 | 3.597 | 3.636 | 3.672 | 0.000 | 26.309 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

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

This Project matures and demonstrates advanced Network Command, Control, Communications, and Intelligence (C3I) technologies into future equipment and systems. This Project accelerates advanced technologies originating from extramural research in academia, will enable intelligent networks, self-sensing/self-healing network, network security, advanced teaming and operations in a Global Positioning System (GPS) degraded or denied GPS environment. This Project also accelerates the Army modernization in next generation Network and Assured Positioning, Navigation, and Timing (APNT) systems. Work in this Project will lead to emerging technologies in areas of strategic importance to the Army in communications and networking, by engaging competitively selected Universities.

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

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 University Technology Development Division.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Advanced Intelligent, Secure and Self-Sensing/Self-Healing Networks | 0.546 | 0.420 | 1.798 |
| ***Description:*** This effort matures and integrates advanced intelligent network solutions with autonomous or self-sensing intelligence to deny corruption, and/or attacks and to execute operational missions securely and reliably. | | | |
| ***FY 2024 Plans:***<br>Will continue maturation and demonstration of AI/ML emerging technologies for Network solutions, optimal network usage and network inference, RF-based deceptive tactical networks, improve cyber defense systems through secure and reliable ML, multi-modal and multi-vantage sensing for joint inference, and network localization. | | | |
| ***FY 2025 Plans:***<br>Will optimize software simulation tools that provide environment-aware radio frequency (RF) pathloss calculations in Army relevant scenarios using terrain feature data from geospatial data sources; optimize artificial intelligence/machine learning (AI/ML) emerging technologies for network solutions, optimal network usage and network inference, RF-based deceptive tactical | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CN3 / *Network Enabling University Adv Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| networks, improve cyber defense systems through secure and reliable ML, multimodal and multi-vantage sensing for joint inference, and network localization to enable a more intelligent and robust communications network.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects planned milestones to support intelligent networks and administrative realignment from task (Advanced Sensors and Non-GPS PNT Systems) within this project. | | | |
| ***Title:*** Advanced Real-Time Tactical Networks<br><br>***Description:*** This effort develops tactical network technology platforms consisting of a fleet of ground and air vehicles that will perform an autonomous reconnaissance mission in a relevant environment.<br><br>***FY 2024 Plans:***<br>Mature and demonstrate an information network that will resiliently support information pathways for sensing, computing, and control in cyber-physical systems, such as autonomous vehicle teams over unreliable communication networks. Mature and demonstrate an information network that responds dynamically to changes in operating conditions through real-time adaptation and evolution to enable continuity of the core services that it provides to the networked system.<br><br>***FY 2025 Plans:***<br>Will mature and demonstrate an information system functional orchestrator with real-time communications service over self-organizing nodes. Will utilize communication network, compute and information pathway status for orchestration and migration of components on substrate node to enable a resilient tactical network with reduced bandwidth requirements.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects planned milestones to support tactical networks and administrative realignment from task (Advanced Sensors and Non-GPS PNT Systems) within this project. | 1.346 | 1.307 | 1.625 |
| ***Title:*** Advanced Sensors and Non-GPS PNT Systems<br><br>***Description:*** Develop advanced sensors with enhanced signal processing software/algorithms to improve assurance against both electronic and kinetic attacks relative to GPS, and that can provide matured Positioning, Navigation and Timing (PNT) technology in disrupted, degraded or denied Global Positioning System (GPS) environments.<br><br>***FY 2024 Plans:***<br>Will continue the development and integration of GNSS global and tactical sensors, exploitation of LEO satellites for robust PNT back up to GPS, and demonstrate capability on a sensor fusion framework.<br><br>***FY 2025 Plans:*** | 1.955 | 2.304 | 0.509 |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CN3 / *Network Enabling University Adv Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| Will mature and demonstrate supporting emerging requirements and technologies for PNT and alternatives to GPS, including performance and assurance improvements against both electronic and kinetic attacks relative to current state-of-the-art GPS, and that can provide PNT technology to users in disrupted, degraded or denied GPS environments; mature and demonstrate the integration of global navigation satellite systems (GNSS) global and tactical sensors, exploitation of Low Earth Orbit (LEO) satellites for robust PNT back up to GPS, and demonstrate capability on a sensor fusion framework.<br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding decrease reflects administrative realignment to task (Advanced Intelligent, Secure and Self-Sensing/Self-Healing Networks) and task (Advanced Real-Time Tactical Networks) within this project. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.847 | 4.031 | 3.932 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>CX7 / *Intelligent Env Battlefield Awareness Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CX7: *Intelligent Env Battlefield Awareness Adv Tech* | - | 4.713 | 6.396 | 7.968 | - | 7.968 | 7.724 | 3.545 | 1.883 | 2.889 | 0.000 | 35.118 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

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

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

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

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

Work in this Project is performed by the United States Army Engineer Research and Development Center Environmental Laboratory, Geospatial Research Laboratory, Information Technology Laboratory, Cold Regions Research and Engineering Laboratory, Construction Research Engineering Laboratory, and Geotechnical and Structures Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Arctic Threats 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. | 1.082 | - | - |
| ***Title:*** Geo-Forensics for Reconnaissance Exploitation<br>***Description:*** This effort provides unique terrestrial patterns to describe and predict the geological, biological, and overall ecological information associated with anti-access/area denial (A2/AD) sites from the continental United States (CONUS) analogs.<br>***FY 2024 Plans:***<br>Will provide a global soil analog tool application in which soil diversity and functionality can be predicted to inform mobility operations. Will also provide final documentation of geo-forensic capabilities for predicting soil provenance and properties within a predictive GIS platform.<br>***FY 2024 to FY 2025 Increase/Decrease Statement:*** | 0.985 | 1.134 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CX7 / *Intelligent Env Battlefield Awareness Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| Funding change reflects planned conclusion of this Science and Technology effort with transition of software and data models to the Predictive GIS Mapping (physical) integration effort within this Project. | | | |
| ***Title:*** Predictive Geographic Information Systems (GIS) Mapping (physical) Demonstration<br>***Description:*** This effort reduces the impact of unknown and changing terrain conditions by automating the integration of disparate datasets and overlays of terrain obstacles producing a high-fidelity map that integrates soil composition, vegetation, hydrology, and permafrost/ice data.<br>***FY 2024 Plans:***<br>Will integrate high resolution remotely sensed weather models demonstrating terrain state changes such as freeze/thaw, and global soil analog tools into a predictive GIS platform.<br>***FY 2025 Plans:***<br>Will integrate soil models into a global soil mapping system incorporating cold region and hydrology effects using ground and surface water conditions to identify potential hazards of extreme cold weather on maneuverability corridors.<br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects the planned milestones to integrate developments from concluding tasks. | 1.585 | 1.248 | 2.073 |
| ***Title:*** Hydrology Mapping Demonstrations<br>***Description:*** This effort matures and demonstrates data tools and models to support high-fidelity battlefield overlay maps that accurately show hydrologic/soil moisture threats (soil, hydrology, and snow/ice) not captured by current terrain mapping capabilities.<br>***FY 2024 Plans:***<br>Will mature hydrologic modeling to support soil moisture change predictions on a prototype GIS platform from field data gained at CONUS test bed sites.<br>***FY 2025 Plans:***<br>Will mature the global watershed analog mapping tool to support the hydrologic computational framework to include flood zone, soil moisture, and run-off mapping.<br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding decrease reflects planned milestones required for computational modeling. | 0.473 | 1.753 | 1.463 |
| ***Title:*** Vegetation Property Demonstrations | 0.588 | 0.627 | 3.002 |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CX7 / *Intelligent Env Battlefield Awareness Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Description:*** This effort provides forest metrics with other Intelligent Environmental Battlefield Awareness Tech threat area parameters to inform global ecological analogues in areas with limited data.<br><br>***FY 2024 Plans:***<br>Will validate interactive machine learning models to assign to global forest analogs (e.g., digital forest twins) incorporated from the U.S. Forest Service.<br><br>***FY 2025 Plans:***<br>Will mature the framework for assignment of global forest analogs from U.S. Forest Service plot data. Will utilize high performance computing (HPC) resources to validate machine learning algorithms for the forest analog tool.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects the planned focus on the use of HPC resources. | | | |
| ***Title:*** Extreme Environmental Effects on Operations Demonstrations<br><br>***Description:*** This effort designs and develops modeling of natural terrain following extreme disturbances that impact operational environments such as wildfires, flash floods, earthquakes and landscape changes induced by high intensity military conflict.<br><br>***FY 2024 Plans:***<br>Will assess sources and linkages to meet foundational and dynamic environmental data requirements for extreme event capabilities within a predictive GIS platform.<br><br>***FY 2025 Plans:***<br>Will mature algorithms for seasonal snow and wildland fire hazards across complex terrains that captures terrain impediments.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding decrease reflects completed assessment of environmental data requirements. | - | 1.634 | 1.430 |
| **Accomplishments/Planned Programs Subtotals** | 4.713 | 6.396 | 7.968 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>CX8 / *Persistent Geophysical Sensing-Infrasound Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CX8: *Persistent Geophysical Sensing-Infrasound Adv Tech* | - | 2.249 | 2.635 | 3.137 | - | 3.137 | 2.085 | 2.611 | 2.994 | 3.167 | 0.000 | 18.878 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

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

This Project matures and demonstrates kitted hardware and software solutions that provide passive, persistent, non-line-of-sight, multi-modal sensing capable of providing fused battlefield intelligence for increased situational awareness in a dynamic operational environment. These technologies provide near-real-time data collection, processing, and alerting on evolving cross-domain threats including strategic and tactical fires, air and ground platforms, as well as critical transportation infrastructure (bridges) and explosive events with applications for deep sensing. These technologies deliver time-critical intelligence for engineer and intelligence communities to provide decisive advantage.

Work in this Project complements Program Element (PE) 0602182A (C3I Applied Research) / Project CX4 (Persistent Geophysical Sensing-Infrasound Apl Tech).

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

Work in this Project is performed at the United States Army Engineer Research and Development Center Geotechnical and Structures Laboratory, Coastal and Hydraulics Laboratory, Construction Engineering Research Laboratory, Cold Regions Research and Engineering Laboratory, Environmental Laboratory, and Information Technology Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Battlefield Intelligence by Geophysical Sensing (BIGS) Demonstration | 2.249 | 2.635 | 3.137 |
| ***Description:*** This effort matures and demonstrates geophysical and geo-sensing technologies to persistently assess battlefield elements to include infrastructure (algorithm refinements) and additional sources of interest, such as explosive and fires events and various threats. Optimization of the array sensors and geometry to improve array performance for new sources of interest while reducing logistics will also be matured and demonstrated. New detection and classification signal processing algorithms will be validated throughout the life of the task in a phased demonstration schedule. | | | |
| ***FY 2024 Plans:***<br>Will optimize and demonstrate algorithm components. Will demonstrate alternate array geometry in a simulated operational environment. | | | |
| ***FY 2025 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CX8 / *Persistent Geophysical Sensing-Infrasound Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| Will demonstrate full complement of automated algorithms for selected sources of interest with optimized array configurations and placement tools in a relevant environment (accounting for terrain/topography and meteorological effects).<br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects planned transition of technologies for Soldier touch point demonstrations and integrations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.249 | 2.635 | 3.137 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>CX9 / *Sensing in Contested Environments Adv Technologies* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CX9: *Sensing in Contested Environments Adv Technologies* | - | 1.043 | 1.104 | 2.083 | - | 2.083 | 0.151 | 0.459 | 2.989 | 3.019 | 0.000 | 10.848 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**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 previously developed sensor packages and adaptive commercial off the shelf sensor technologies on existing unmanned ground vehicles (UGV) platforms to gather end-user feedback. The capabilities resulting from this project provide Soldiers the capability to understand biological hazards present in subterranean environments and take necessary steps to mitigate or avoid these threats.

Work in this Project complements Program Element (PE) 0602182A (C3I Applied Research) / Project CX5 (Sensing in Contested Environments Technologies).

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 at the United States Army Engineer Research and Development Center Environmental Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Non-traditional Threat Detection in Contested Environments Tech | 1.043 | 1.104 | 2.083 |
| ***Description:*** This effort identifies, examines, prioritizes, and exploits commercial of the shelf capabilities from multiple sources that can accurately detect biological and water quality hazards relevant to operations in subterranean environments from point of ingress/egress to evaluate exposure potential and affects.<br><br>***FY 2024 Plans:***<br>Will demonstrate macroscopic and microscopic organism classification and hazard detection in a field realistic environment.<br><br>***FY 2025 Plans:***<br>Will optimize hardware to meet requirements. Will demonstrate macro biological threat detection at additional sites inside and outside the continental United States.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects the planned milestones for this effort to conduct demonstrations at multiple site locations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.043 | 1.104 | 2.083 |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CX9 / *Sensing in Contested Environments Adv Technologies* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>CZ5 / *Subterranean Detection and Monitoring Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CZ5: *Subterranean Detection and Monitoring Adv Tech* | - | 0.400 | 1.272 | 1.432 | - | 1.432 | 1.834 | 2.328 | 0.862 | 1.388 | 0.000 | 9.516 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

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

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

Work in this Project complements Program Element (PE) 0602182A (C3I Applied Research) / Project CX6 (Subterranean Detection and Monitoring Apl Tech).

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

Work in this Project is performed by the United States Army Engineer Research and Development Center Geotechnical and Structures Laboratory, Construction Engineering Research Laboratory, Coastal and Hydraulics Laboratory and Cold Regions Research and Engineering Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Cavity Assessment in Variable Environments-Subterranean (CAVES) Demonstrations | 0.400 | 1.272 | 1.432 |
| ***Description:*** This effort validates and demonstrates an integrated suite of tunnel detection and perimeter security systems for application in variable terrain, and complex geologic environments, such as mountains, and hard rock geology common in the western pacific.<br><br>***FY 2024 Plans:***<br>Will conduct field experimentation to baseline capabilities of tunnel detection and perimeter security technologies in an operationally relevant environment.<br><br>***FY 2025 Plans:***<br>Will mature and demonstrate systems in a simulated operational environment using selected technologies.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects planned milestones for this effort. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.400 | 1.272 | 1.432 |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>CZ5 / *Subterranean Detection and Monitoring 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 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>DB5 / *Enabling Long Standoff 3D (ELS3D) Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DB5: *Enabling Long Standoff 3D (ELS3D) Adv Tech* | - | - | 1.045 | 1.502 | - | 1.502 | 2.593 | 4.931 | 5.490 | 6.091 | 0.000 | 21.652 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

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

This Project will integrate and demonstrate and mature a low size, weight, and power (SWAP) laser transmitter, processing algorithms and calibration models tailored for higher resolution 3D data collections over larger areas from longer stand-off for mapping, Intelligence Surveillance and Reconnaissance (ISR) and targeting. Long standoff airborne collection of high-resolution quick turnaround 3D data is vital for mission planning, target detection and identification, fire control, autonomous navigation, kinetic targeting, and battle damage assessment. Existing light detection and ranging (LIDAR) systems are limited to short standoff and/or near-nadir collection, limiting their use against near-peer adversaries and restricting the provision of 3D data. The payoff will enable long standoff airborne collection of high-resolution quick turnaround 3D data through the development LIDAR subsystems and processing algorithms.

Work in this Project complements Program Element (PE) 0602182A (C3I Applied Research) / Project DB4 (Enabling Long Standoff 3D (ELS3D) Tech).

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

Work in this Project is performed by the United States Army Engineer Research and Development Center Geospatial Research Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Enabling Long Standoff 3D (ELS3D) Demonstration | - | 1.045 | 1.502 |
| ***Description:*** This effort will demonstrate and integrate a prototype airborne system to collect long standoff high-resolution quick turnaround 3D data. Sensors will be ruggedized for operation at very high altitudes for collection of high-resolution 3D data. This long standoff collection will meet Army needs for mapping, ISR, and targeting, and be of a sufficient SWAP to be integrated onto Army platforms. | | | |
| ***FY 2024 Plans:***<br>Will conduct hardware design for SWAP-optimization of lidar components, as initial phase of the advanced collection methodology. | | | |
| ***FY 2025 Plans:***<br>Will mature a calibration framework with rigorous error propagation, signal processing and image formation software in support of long standoff data collection. | | | |
| ***FY 2024 to FY 2025 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>DB5 / *Enabling Long Standoff 3D (ELS3D) Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| Funding increase reflects the planned milestones for the development of a prototype system and processing algorithms. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 1.045 | 1.502 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>DE7 / *Understanding Environment as a Threat Adv Tech* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DE7: *Understanding Environment as a Threat Adv Tech* | - | - | 2.742 | 1.433 | - | 1.433 | 1.017 | - | - | - | 0.000 | 5.192 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**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.

Work in this Project complements Program Element (PE) 0602182A (C3I Applied Technology) / Project DE6 (Understanding the Environment as a Threat Tech).

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

Work in this Project is performed by the United States Army Engineer Research and Development Center Environmental Laboratory, Geospatial Research Laboratory, and Information Technology Laboratory.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Environmental Threat Technology Demonstrations for route planning | - | 0.682 | - |
| ***Description:*** This effort matures and demonstrates a software tool that informs and balances the risk of exposure to environmental threats with maneuver constraints along potential routes. The software integrates the risks associated with different environmental matrices in complex urban environments and includes the capability for routing in off-road scenarios.<br><br>***FY 2024 Plans:***<br>Will demonstrate operational viability of individual course-forecasting algorithms. Will demonstrate final threat-overlay software products and validate performance within an established interface.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding change reflects the planned life cycle conclusion of this Science and Technology effort. | | | |
| ***Title:*** Hazard Prediction Demonstration | - | 1.030 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>DE7 / *Understanding Environment as a Threat Adv Tech* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***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><br>***FY 2024 Plans:***<br>Will demonstrate and validate suite of standalone air, water, and soil media model algorithms using toxic industrial chemical/ material (TIC/TIM) databases. Will demonstrate final threat-overlay software product and validate performance within an established interface.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding change reflects the planned life cycle conclusion of this Science and Technology effort. | | | |
| ***Title:*** Subsurface Forensics Demonstration<br><br>***Description:*** This effort matures and demonstrates sensing technologies for TIC/TIMs to detect illicit activities with authentic wastewater treatment influent.<br><br>***FY 2024 Plans:***<br>Will validate capabilities to exploit pre-existing physical, chemical, and biological information from urban subterranean systems for threat identification with special and temporal resolution in current and future operational environments.<br><br>***FY 2025 Plans:***<br>Will demonstrate techniques for ultra-low detection levels of explosive constituents and other industrial and commercial chemical threats for reverse-point sourcing threats in dense urban and subterranean environments.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>Funding increase reflects planned milestones to conduct field demonstrations. | - | 1.030 | 1.433 |
| **Accomplishments/Planned Programs Subtotals** | - | 2.742 | 1.433 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | | Date: March 2024 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 3 | R-1 Program Element (Number/Name)<br>PE 0603042A / *C3I Advanced Technology* | Project (Number/Name)<br>DI6 / *Anti-Tamper Advanced Tech Development* | |

| COST ($ in Millions) | Prior Years | FY 2023 | FY 2024 | FY 2025 Base | FY 2025 OCO | FY 2025 Total | FY 2026 | FY 2027 | FY 2028 | FY 2029 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DI6: *Anti-Tamper Advanced Tech Development* | - | - | - | 1.327 | - | 1.327 | 1.329 | 1.330 | 1.344 | 1.357 | 0.000 | 6.687 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Anti-Tamper Advanced Tech Development is a new start within the C3I Advanced Technology program in FY 2025.

Funding for DI6 (Anti-Tamper Advanced Tech Development) transitioned from PE 0602146A (Network C3I Technology) / AV5 (Protective Technologies) to support maturation to TRL6 and transition of anti-tamper technologies into DoD and Army weapons systems.

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

This Project matures and transitions Anti-Tamper tools, devices, and techniques that protect acquisition program systems and Critical Program Information (CPI) from evolving adversarial threats. Efforts are coordinated with Department of Defense (DoD) Executive Agent for Anti-Tamper.

Work in this Project complements Program Element (PE) 0602146 (Protective Technologies) / Project AV5 (Protective Technologies).

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 Aviation and Missile Center (AvMC).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|
| ***Title:*** Anti-Tamper Advanced Tech Development | - | - | 1.327 |
| ***Description:*** This effort matures tools, devices, and techniques that protect acquisition program systems and (CPI) from adversarial threats.<br><br>***FY 2025 Plans:***<br>Will mature advanced microelectronics-based anti-tamper security solutions to allow for integration of these solutions in Army and DoD weapons systems to meet their Program Protection requirements.<br><br>***FY 2024 to FY 2025 Increase/Decrease Statement:***<br>This is a new effort in FY 2025. Funding transitioned from PE 0602146A (Network C3I Technology) / AV5 (Protective Technologies) to support maturation to TRL6 and transition of anti-tamper technologies into DoD and Army weapons systems. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 1.327 |

| Exhibit R-2A, RDT&E Project Justification: PB 2025 Army | | Date: March 2024 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603042A / *C3I Advanced Technology* | **Project (Number/Name)**<br>DI6 / *Anti-Tamper Advanced Tech Development* |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A