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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	45.799	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	45.799
101: <i>Tactical Command and Control</i>	-	20.042	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.042
1AA: <i>Tactical Computer Science Demonstrations (CA)</i>	-	9.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.000
243: <i>Sensors And Signals Processing</i>	-	16.757	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.757

Note

In Fiscal Year 2020 (FY20) this Program Element (PE) was realigned with continuity of effort to the following PEs:

- * PE 0603462A Next Generation Combat Vehicle Advanced Technology
- * PE 0603463A Network C3I Advanced Technology
- * PE 0603466A Air and Missile Defense Advanced Technology

A. Mission Description and Budget Item Justification

This PE matures and demonstrates technologies that allow the Warfighter to effectively collect, analyze, transfer and display situational awareness information in a network-centric battlefield environment, and the technologies that enable the integration of Robotics and Autonomous Systems (RAS) through Mission Command. It matures and demonstrates architectures, hardware, software and techniques that enable synchronized mission command (MC) during rapid, mobile, dispersed and Joint operations. Project 101 matures software, algorithms, services and devices to more effectively integrate MC across all echelons and enable more effective utilization of Warfighter resources including intelligent power management and distribution through accelerated information to decisions and rapid MC on the move. Project 243 matures and demonstrates signal processing and information/intelligence fusion software, algorithms, services and systems for Army sensors; radio frequency (RF) systems to track and identify enemy forces and personnel; and multi-sensor control and correlation software and algorithms to improve reconnaissance, surveillance, tracking, and target acquisition.

Work in this PE complements PE 0602120A (Sensors and Electronic Survivability), PE 0602270A (Electronic Warfare Technology), PE 0602303A (Missile Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602782A (Command, Control, Communications Technology), and PE 0603270A (Electronic Warfare Technology), and is coordinated with PE 0602783A (Computer and Software Technology).

FY20 realignments are due to financial restructuring in support of 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.

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>
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Work in this PE is performed by the Research, Development, and Engineering Command, Aberdeen Proving Ground, MD.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	43.856	0.000	0.000	-	0.000
Current President's Budget	45.799	0.000	0.000	-	0.000
Total Adjustments	1.943	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.800	-			
• SBIR/STTR Transfer	-0.857	-			

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

Project: 1AA: *Tactical Computer Science Demonstrations (CA)*
 Congressional Add: *Assured Positioning, Navigation and Timing*
 Congressional Add: *FY 2018 NDAA SEC 825 MDAP Cost Overrun*

	FY 2019	FY 2020
	8.997	-
	0.003	-
Congressional Add Subtotals for Project: 1AA	9.000	-
Congressional Add Totals for all Projects	9.000	-

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Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>				Project (Number/Name) 101 / <i>Tactical Command and Control</i>			
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
101: <i>Tactical Command and Control</i>	-	20.042	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	20.042

Note
 In Fiscal Year 2020 (FY20) this Project was realigned to:
 Program Element (PE) 0603462A Next Generation Ground Combat Vehicle Advanced Technology:
 * Project BH3 C4ISR Modular Autonomy Advanced Technology
 PE 0603463A Network C3I Advanced Technology:
 * Project AQ8 High Tempo Data Driven Decision Tools Adv Tech
 * Project AV8 Navigation Warfare (NAVWAR) Advanced Technology
 * Project AW2 Autonomous Navigation Advanced Technology
 * Project AW4 DoD PNT M&S Collaborative Initiative (CI) Adv Tech
 * Project AW6 Modular GPS Independent Sensors Advanced Tech
 * Project AR2 Energy Informed Operations Advanced Technology

A. Mission Description and Budget Item Justification

This Project matures and demonstrates software, algorithms, services and devices that move and display timely and relevant information across the battlefield to provide Commanders at all echelons with situational awareness (SA) that allows them to understand, decide and act faster than their adversaries. This project also matures and demonstrates software, algorithms and devices supporting information storage and retrieval; digital transfer and display of battlefield SA, with an emphasis on positioning, navigation, and timing (PNT) and power and energy resource information while keeping in mind the cognitive limit of the Soldier's use of software, algorithms and services optimized for expeditionary and uninterrupted mission command.

FY20 realignments are due to financial restructuring in support of 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.

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

	FY 2019	FY 2020	FY 2021
Title: Integrated Mission Command (MC)	3.641	-	-
Description: This effort matures and demonstrates technologies to simplify mission command (MC) software and data architectures and reduce complexity in all battlefield environments, to include command post (CP), mounted, and dismounted operations.			
Title: Assured Positioning, Navigation and Timing (A-PNT)	9.395	-	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>	Project (Number/Name) 101 / <i>Tactical Command and Control</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Description: This effort 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.			
Title: Advanced Intelligent Power Management & Distribution	2.000	-	-
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			
Title: Assault Breaker II (DARPA)	5.000	-	-
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.006	-	-
Description: FY 2018 NDAA SEC 825 MDAP Cost Overrun			
Accomplishments/Planned Programs Subtotals	20.042	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>	Project (Number/Name) 1AA / <i>Tactical Computer Science Demonstrations (CA)</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
1AA: <i>Tactical Computer Science Demonstrations (CA)</i>	-	9.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.000

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Tactical Computer Science and Sensor advanced technology development.

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

	FY 2019	FY 2020
<i>Congressional Add:</i> Assured Positioning, Navigation and Timing	8.997	-
<i>FY 2019 Accomplishments:</i> Assured Positioning, Navigation and Timing		
<i>Congressional Add:</i> FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.003	-
<i>FY 2019 Accomplishments:</i> FY 2018 NDAA SEC 825 MDAP Cost Overrun		
Congressional Adds Subtotals	9.000	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603772A / <i>Advanced Tactical Computer Science and Sensor Technology</i>	Project (Number/Name) 243 / <i>Sensors And Signals Processing</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
<i>243: Sensors And Signals Processing</i>	-	16.757	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.757

Note

In Fiscal Year 2020 (FY20) this Project was realigned to:
 Program Element (PE) 0603463A Network C3I Advanced Technology:
 * Project AO1 UNT - Every Receiver is a Sensor Advanced Tech
 * Project AV4 Foundational S&T for Network C3I Advanced Tech
 PE 0603466A Air and Missile Defense Advanced Technology:
 * Project AD6 Next Generation Fires Radar Advanced Technology

A. Mission Description and Budget Item Justification

This Project matures and demonstrates improved radar, sensor fusion, and correlation software, services, devices and systems for wide area reconnaissance, surveillance, tracking and targeting of ground and aerial platforms and individuals, including complex and urban environments. Sensor fusion efforts mature and demonstrate software, algorithms and services for sensor management, data correlation, and relationship discovery for a multi-intelligence fusion system. Sensor and simulated sensor candidates may include moving-target-indicator/synthetic aperture radar, electro-optical/infrared (EO/IR), signals intelligence (SIGINT), measurements and signatures intelligence (MASINT), human intelligence (HUMINT), multiple intelligence (Multi-Int) and biometrics.

FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

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

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

	FY 2019	FY 2020	FY 2021
Title: Collaborative Intelligence, Surveillance and Reconnaissance (ISR) Sensor processing and analytics	4.550	-	-
Description: This effort develops software that gathers data from multi-function Airborne ISR sensor sources into a single common operating environment to streamline analysts processing, exploitation and dissemination (PED) workflows. The focus centers on developing scalable software that provides a near real time PED capability on board the platform with applicability at the ground stations and reach back for forensics and pattern analysis. It will increase the utility of moving target indicator (MTI) radar to the greater multiple intelligence (multi-INT) picture for better origin-to-destination tracking, which is crucial to understanding the higher-level threat picture and increases the effectiveness and action-ability of battlespace awareness/intelligence data throughout an area of operations. This effort implements an open architecture extensible throughout the tactical enterprise, allowing for growth to include future ISR sensors.			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Title: Counter-concealment Moving Target Indicator (MTI) Airborne Radar Demonstration Description: This effort will mature antenna design and signal processing and define the architecture to ensure simplified integration on a Multi-Int platform to deliver an advanced generation of airborne MTI radars. This will allow for third party mode development and exploitation techniques, with emphasis on automated target declaration and tracking. Efforts focus on antenna and signal processing advancements that allow the detection/tracking of targets despite camouflage, concealment and deception and a well-defined systems architecture to cover large areas and persistently scan named areas of interest.		2.908	-	-
Title: Multi-mode Air Defense Radar Demonstration Description: This effort matures the architectures, processing and components necessary to deliver next generation capability, flexibility and supportability to the fires family of radar systems. Efforts focus on development of a modular and scalable open architecture that is extensible to multiple radar systems technologies in support of air defense and area/base camp protection.		5.391	-	-
Title: Degraded Visual Environment (DVE) ? Air Description: This effort matures and demonstrates software and hardware for a millimeter wave radar system (conformal phased array radar) to provide obscurant penetration for terrain and object awareness while providing pilotage aids in all degraded visual environments.		3.903	-	-
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun Description: FY 2018 NDAA SEC 825 MDAP Cost Overrun		0.005	-	-
Accomplishments/Planned Programs Subtotals		16.757	-	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				