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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

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| Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development | R-1 Program Element (Number/Name) PE 0607148A / AN/TPQ-53 Counterfire Target Acquisition Radar System |
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| COST (\$ in Millions) | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | FY 2024 | FY 2025 | FY 2026 | FY 2027 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | - | 47.752 | 62.559 | - | 62.559 | 55.312 | 33.874 | 8.737 | 8.822 | Continuing | Continuing |
| BY8: AN/TPQ-53 Counterfire Target Acquisition Radar Sys | - | - | 47.752 | 62.559 | - | 62.559 | 55.312 | 33.874 | 8.737 | 8.822 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This funding line is a key enabler of the Army Long Range Precision Fires (LRPF) Modernization Priority in support of the AN/TPQ-53 Counterfire target Acquisition Radar program. The AN/TPQ-53 Counterfire Target Acquisition Radar System is a highly mobile radar set that automatically detects, classifies, tracks, and locates the point of origin of projectiles fired from mortar, artillery, and rocket systems with sufficient accuracy for first round fire for effect. It mitigates close combat radar coverage gaps by providing a 90 degree search sector (stare mode) as well as 360 degree coverage (rotating) and replaces the AN/TPQ-36 and AN/TPQ-37 Firefinder Radars. The AN/TPQ-53 system interoperates with mission command systems to provide the maneuver commander increased counterfire radar flexibility. The AN/TPQ-53 is deployed as part of the Counter-Rocket, Artillery, Mortar (C-RAM) system of systems. It provides data to the Forward Area Air Defense Command and Control (FAAD C2) node for the sense and warn force protection capability. The AN/TPQ-53 currently supports contingency operations to include Operation Inherent Resolve (OIR) and is provided to Brigade Combat Teams (BCTs), Field Artillery Brigades (FABs) and Division Artilleries (DIVARTYs).

Fiscal year (FY) 2023 modification-in-service research, development, test and evaluation (RDT&E) funds in the amount of \$62.559 million supports the design and development of a hardware/software Multi Domain Operation (MDO) digitization upgrade kit to enhance system survivability, electronic protection (EP), bandwidth agility, and an integrated fires capability in a peer/near-peer threat environment. This includes development, integration, testing, and providing a capability beyond the current range and location accuracy requirements. Funding also supports efforts required to counter indirect fire and improve survivability against electronic warfare threats identified in the Validated Online Lifecycle Threat (VOLT).

| B. Program Change Summary (\$ in Millions) | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 56.681 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 47.752 | 62.559 | - | 62.559 |
| Total Adjustments | 0.000 | -8.929 | 62.559 | - | 62.559 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -8.929 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Adjustments to Budget Years | - | - | 62.559 | - | 62.559 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army | | Date: April 2022 |
| Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development</i> | R-1 Program Element (Number/Name) PE 0607148A / <i>AN/TPQ-53 Counterfire Target Acquisition Radar System</i> | |
| <u>Change Summary Explanation</u> FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding. | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2023 Army | | | | | | | | | | Date: April 2022 | | |
| Appropriation/Budget Activity 2040 / 7 | | | | | R-1 Program Element (Number/Name) PE 0607148A / AN/TPQ-53 Counterfire Target Acquisition Radar System | | | | | Project (Number/Name) BY8 / AN/TPQ-53 Counterfire Target Acquisition Radar Sys | | |
| COST (\$ in Millions) | Prior Years | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | FY 2024 | FY 2025 | FY 2026 | FY 2027 | Cost To Complete | Total Cost |
| BY8: AN/TPQ-53 Counterfire Target Acquisition Radar Sys | - | - | 47.752 | 62.559 | - | 62.559 | 55.312 | 33.874 | 8.737 | 8.822 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This funding line is a key enabler of the Army Long Range Precision Fires (LRPF) Modernization Priority in support of the AN/TPQ-53 Counterfire target Acquisition Radar program. The AN/TPQ-53 Counterfire Target Acquisition Radar System is a highly mobile radar set that automatically detects, classifies, tracks, and locates the point of origin of projectiles fired from mortar, artillery, and rocket systems with sufficient accuracy for first round fire for effect. It mitigates close combat radar coverage gaps by providing a 90 degree search sector (stare mode) as well as 360 degree coverage (rotating) and replaces the AN/TPQ-36 and AN/TPQ-37 Firefinder Radars. The AN/TPQ-53 system interoperates with mission command systems to provide the maneuver commander increased counterfire radar flexibility. The AN/TPQ-53 is deployed as part of the Counter-Rocket, Artillery, Mortar (C-RAM) system of systems. It provides data to the Forward Area Air Defense Command and Control (FAAD C2) node for the sense and warn force protection capability. The AN/TPQ-53 currently supports contingency operations to include Operation Inherent Resolve (OIR) and is provided to Brigade Combat Teams (BCTs), Field Artillery Brigades (FABs) and Division Artilleries (DIVARTYS).

Fiscal year (FY) 2023 modification-in-service research, development, test and evaluation (RDT&E) funds in the amount of \$62.559 million supports the design and development of a hardware/software Multi Domain Operation (MDO) digitization upgrade kit to enhance system survivability, electronic protection (EP), bandwidth agility, and an integrated fires capability in a peer/near-peer threat environment. This includes development, integration, testing, and providing a capability beyond the current range and location accuracy requirements. Funding also supports efforts required to counter indirect fire and improve survivability against electronic warfare threats identified in the Validated Online Lifecycle Threat (VOLT).

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

| | FY 2021 | FY 2022 | FY 2023 |
|---|----------------|----------------|----------------|
| Title: MDO Digitization / Distributed Digital Receiver Exciter (DDREX) | - | 35.760 | 49.752 |
| Description: MDO Digitization / Distributed Digital Receiver Exciter (DDREX) is a mod-in-service Engineering Change Proposal (ECP) that provides increased force protection by addressing emerging and evolving electronic attack threats, improving electronic protection capabilities against Cyber Electromagnetic Activity (CEMA), and improving performance in a congested spectrum/environment via waveform diversity, spectrum agility and broadening the operational bandwidth. The system is also less susceptible to directed energy, jamming and anti-radiation missiles and provides improved extended range capability to enable timely and accurate targetable data in support of Long Range Precision Fires (LRPF). | | | |
| FY 2022 Plans: FY 2022 modification-in-service research, development, test and evaluation (RDT&E) funds in the amount of \$35.760 million supports the DDREX modification kit system design, architecture and interface definition, hardware/software design and | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2023 Army | | Date: April 2022 | | |
| Appropriation/Budget Activity 2040 / 7 | R-1 Program Element (Number/Name) PE 0607148A / AN/TPQ-53 Counterfire Target Acquisition Radar System | Project (Number/Name) BY8 / AN/TPQ-53 Counterfire Target Acquisition Radar Sys | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2021 | FY 2022 | FY 2023 |
| development, initial system integration and test and material required for engineering development models. This DDREX development effort also includes associated government engineering support. FY 2023 Plans: FY 2023 modification-in-service research, development, test and evaluation (RDT&E) funds in the amount of \$49.752 million supports the continuation of DDREX modification kit design, architecture and interface definition, hardware/software design and development in support of Capability Set #1 and Capability Set #2, and the procurement, delivery, integration, and testing of four DDREX Engineering Development Models (EDMs). This digitization upgrade kit will enhance system survivability (electronic protect (EP)) in a peer/near-peer threat environment and provide a capability that supports the latest range and location accuracy requirements. These Capability Sets, which include development of DDREX hardware and software to enable advanced survivability capability, will increase Counterfire Target Acquisition (CTA) performance and radar survivability. FY 2022 to FY 2023 Increase/Decrease Statement: Increase in FY 2023 funding required for additional engineering development model (EDM) studies as well as EDM phase 2 software development for increased system protection/survivability. | | | | |
| Title: Modernization Development Efforts and Emerging Threats Description: Modernization Development Efforts and Emerging Threats provides the ability to address upcoming threats on the battlefield by countering indirect fire and improving survivability against electronic warfare threats identified in the Validated Online Lifecycle Threat (VOLT). These efforts will continue to address complex evolving threats through advanced survivability development. FY 2022 Plans: FY 2022 funding of \$8.453 million supports software updates to counter new and emerging indirect fire munitions and improve survivability against electronic warfare threats identified in the VOLT. FY 2023 Plans: FY 2023 modification-in-service research, development, test and evaluation (RDT&E) funds in the amount of \$9.037 million supports the Modernization Development Efforts and Emerging Threats. This requirement provides the ability to address upcoming threats on the battlefield by countering indirect fire and improving survivability against electronic warfare threats identified in the VOLT. FY 2022 to FY 2023 Increase/Decrease Statement: Increase in FY 2023 funding required for modeling and simulation efforts in support of Capability Set #2. | | - | 8.453 | 9.037 |
| Title: Program Management Support | | - | 1.796 | 3.770 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2021 | FY 2022 | FY 2023 |
|--|----------------|----------------|----------------|
| <p>Description: Program management efforts include engineering, integration, and test support associated with DDREX development and modernization efforts addressing new and emerging threats.</p> <p>FY 2022 Plans: FY 2022 funding of \$1.796 million supports program management requirements.</p> <p>FY 2023 Plans: FY 2023 funding of \$3.770 million supports program management requirements.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Increase in FY 2023 funding in support of two DDREX software baselines compared to one software baseline in FY 2022.</p> | | | |
| <p>Title: FY22 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638.</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638.</p> | - | 1.743 | - |
| Accomplishments/Planned Programs Subtotals | - | 47.752 | 62.559 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| Line Item | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total | FY 2024 | FY 2025 | FY 2026 | FY 2027 | Cost To Complete | Total Cost |
| • 0604823A: Firefinder | 18.278 | - | 0.000 | - | 0.000 | - | - | - | - | Continuing | Continuing |
| • B05310: AN/TPQ-53 Counterfire Target Acquisition Radar | 71.404 | - | 91.233 | - | 91.233 | - | - | - | - | Continuing | Continuing |
| • BA5315: AN/TPQ-53 MOD-IN-SERVICE LINE | - | 26.694 | 70.975 | - | 70.975 | 101.825 | 119.283 | 120.089 | 120.035 | Continuing | Continuing |

Remarks

D. Acquisition Strategy
The AN/TPQ-53 leverages technology developed in the multi-mission radar advanced technology objective (ATO) program. A Full Rate Production (FRP) decision was obtained in December 2015. The FRP contract to fill the remainder of the Army Acquisition Objective (AAO) was awarded in March 2017. Additionally, all initial

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| <p>production systems will be retrofitted to the FRP configuration. The AAO was increased from 174 to 189 systems in May 2017; the program has procured the AAO of 189 systems. Army approved a Total Army Analysis (TAA) force structure change in FY 2020. The AN/TPQ-53 system replaces all of the AN/TPQ-36 and AN/TPQ-37 systems in the fleet.</p> <p>The AN/TPQ-53 multi-domain operations digitization effort full-up development begins in FY 2022. This effort will build upon ongoing full rate production (FRP) configuration risk mitigation activities and upgrades such as Gallium Nitride (GaN), signal data processor (SDP), extended range (ER), electronic protection, and secure contractor facilitization efforts. The initial development task order will take place on the FRP Indefinite Delivery Indefinite Quantity (IDIQ) contract in 1Q FY 2022 and will include engineering development, design, prototyping, subsystem integration and test, and survivability software (electronic protect). Due to the Period of Performance on the FRP IDIQ, a second development order will be put in place in 2QFY23 to develop and harden the survivability software. The development work starting in FY23 culminates in an Operational Test in 4QFY25. Initial production representative assets to include an initial survivability capability will undergo a DDREX Live Fire Soldier Touch Point in FY 2024 to support a procurement decision for 51 digitization mod kits. The program will utilize FY 2024-2026 procurement funds to support the mod kit buys, organic depot facilitization, and updates to technical manuals and training materials. Supply transition and full material release are planned for FY 2026. The program will utilize procurement funds to retrofit and re-field systems with digitization mod kits beginning in FY 2026. In FY 2027, the digitization configuration transitions to organic depot support and its related software build transitions to organic software support.</p> <p>The AN/TPQ-53 program will develop growing capability and support Army demonstration and test initiatives to increase integrated offensive and defensive capability across warfighter functions and multiple domains.</p> | | |

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army | | | | | | | | | | | | Date: April 2022 | | | |
|---|------------------------|--------------------------------|-------------|---|------------|---------|------------|--|------------|-------------|------------|------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 2040 / 7 | | | | PE 0607148A / AN/TPQ-53 Counterfire Target Acquisition Radar System | | | | BY8 / AN/TPQ-53 Counterfire Target Acquisition Radar Sys | | | | | | | |
| Management Services (\$ in Millions) | | | | FY 2021 | | FY 2022 | | FY 2023 Base | | FY 2023 OCO | | FY 2023 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| FY22 SBIR/STTR Transfer | SS/TBD | Various : Various | - | - | | 1.743 | May 2022 | - | | - | | - | 0.000 | 1.743 | Continuing |
| Subtotal | | | - | - | | 1.743 | | - | | - | | - | 0.000 | 1.743 | N/A |
| Product Development (\$ in Millions) | | | | FY 2021 | | FY 2022 | | FY 2023 Base | | FY 2023 OCO | | FY 2023 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Modernization Development Efforts and Emerging Threats | SS/CPFF | Lockheed Martin : Syracuse, NY | - | - | | 8.453 | Mar 2022 | 9.037 | Dec 2022 | - | | 9.037 | 0.000 | 17.490 | Continuing |
| MDO Digitization / Distributed Digital Receiver Exciter (DDREX) | SS/CPFF | Lockheed Martin : Syracuse, NY | - | - | | 35.760 | Mar 2022 | 49.752 | Dec 2022 | - | | 49.752 | 0.000 | 85.512 | Continuing |
| Subtotal | | | - | - | | 44.213 | | 58.789 | | - | | 58.789 | 0.000 | 103.002 | N/A |
| Support (\$ in Millions) | | | | FY 2021 | | FY 2022 | | FY 2023 Base | | FY 2023 OCO | | FY 2023 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Program Management Support - Government | SS/Various | Various : Various | - | - | | 0.916 | Mar 2022 | 1.922 | Nov 2022 | - | | 1.922 | 0.000 | 2.838 | Continuing |
| Program Management Support - Contractor | SS/Various | Various : Various | - | - | | 0.880 | Mar 2022 | 1.848 | Nov 2022 | - | | 1.848 | 0.000 | 2.728 | Continuing |
| Subtotal | | | - | - | | 1.796 | | 3.770 | | - | | 3.770 | 0.000 | 5.566 | N/A |
| Project Cost Totals | | | - | - | | 47.752 | | 62.559 | | - | | 62.559 | 0.000 | 110.311 | N/A |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army | | Date: April 2022 |
| Appropriation/Budget Activity 2040 / 7 | R-1 Program Element (Number/Name) PE 0607148A / AN/TPQ-53 Counterfire Target Acquisition Radar System | Project (Number/Name) BY8 / AN/TPQ-53 Counterfire Target Acquisition Radar Sys |

Schedule Details

| Events | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| DDREX System, Hardware and Software Development | 1 | 2022 | 3 | 2025 |
| DDREX System Integration and Test | 3 | 2023 | 4 | 2025 |
| DDREX Modkit Critical Design Review | 4 | 2022 | 4 | 2022 |
| DDREX Soldier Touch Point | 3 | 2024 | 3 | 2024 |
| DDREX Operational Test | 4 | 2025 | 4 | 2025 |
| DDREX Supply Transition | 2 | 2026 | 2 | 2026 |
| DDREX Full Material Release | 2 | 2026 | 2 | 2026 |
| DDREX Organic Repair Transition | 1 | 2027 | 1 | 2027 |
| DDREX Software Transition | 1 | 2027 | 1 | 2027 |
| Modernization, Emerging Threats and Testing - FY 2021 VOLT | 1 | 2022 | 2 | 2023 |
| Modernization, Emerging Threats and Testing - FY 2023 VOLT | 2 | 2023 | 2 | 2025 |
| Modernization, Emerging Threats and Testing - FY 2025 VOLT | 2 | 2025 | 2 | 2027 |