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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 0607139A / <i>Improved Turbine Engine Program</i> |
|---|--|

| 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 | - | 232.159 | 260.024 | 228.036 | - | 228.036 | 205.191 | 133.473 | 111.068 | 69.591 | Continuing | Continuing |
| ES6: <i>Improved Turbine Engine Program</i> | - | 232.159 | 260.024 | 228.036 | - | 228.036 | 205.191 | 133.473 | 111.068 | 69.591 | Continuing | Continuing |

Program MDAP/MAIS Code: 487

A. Mission Description and Budget Item Justification

This funding line is a key enabler of the army Modernization Priorities in support of the Improved Turbine Engine Program (ITEP). ITEP develops, tests, qualifies, and integrates the next generation turboshaft engine on Future Attack Reconnaissance Aircraft (FARA), Black Hawk and Apache aircraft. The Improved Turbine Engine (ITE) replaces the existing T700 engine design originated in the 1970's and meets the operational requirement of 6,000 feet pressure altitude and 95 degrees (6K/95). The ITE will fit inside the existing engine bays of the Black Hawk and Apache Helicopters and provides a significant power enhancement of up to fifty percent (total of 3,000 class shaft horsepower) with increased fuel efficiency. Additional benefits include improved design life, enhanced reliability, lower maintenance cost and restored capability lost due to aircraft weight growth without an increase to the logistics footprint. The program consists of systems engineering and program management, detailed design engineering, design assurance, hardware manufacturing and testing, component and module level development and testing, system level testing and qualification, and platform integration and qualification.

FY 2021 funding completed Apache Incremental Critical Design Review #1 (iCDR), completed Black Hawk Integrated Baseline Review (IBR), completed the Live Fire Test Design Plan, continues the engine OEM EMD effort begun in FY 2019, continues engine component testing leading to First Engine To Test (FETT), began Preliminary Flight Rating (PFR) test planning, began physical airframe integration, initiated Apache A-Kit iCDR #2, and initiated Black Hawk A-Kit PDR. FY 2022 funding will continue PFR testing leading to a Preliminary Flight Rated engine in FY 2023, continues physical airframe integration, and continues Live Fire detailed test planning, completes Apache A-Kit iCDR #2, completes Black Hawk A-Kit PDR, and initiates Black Hawk A-Kit CDR. FY 2023 funding provides for completion of Black Hawk A-Kit CDR, completion of Live Fire detailed test planning, initiation of aircraft flight/qualification testing, and the initiation of engine full qualification testing. FY 2024 funding provides for continuation of aircraft flight/qualification testing, completion of Live Fire static engine tests, completion of engine qualification, and initiation of work to prepare for the Live Fire dynamic engine tests. FY 2025 funding provides for completion of Live Fire dynamic engine tests, continuation of flight/qualification testing, beginning of Low Rate Initial Production (LRIP), execution of Initial Operational Test and Evaluation (IOTE), beginning engine integration and A-kit development for the H-60V platform, and initiation of work to prepare for the Live Fire platform level testing (as needed). FY 2026 funding provides for H-60V A-kit CDR, and begins physical airframe integration. FY 2027 funding provides for continued H-60V physical integration and begins flight testing.

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|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 232.159 | 275.024 | 0.000 | - | 0.000 |
| Current President's Budget | 232.159 | 260.024 | 228.036 | - | 228.036 |
| Total Adjustments | 0.000 | -15.000 | 228.036 | - | 228.036 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -15.000 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Adjustments to Budget Years | - | - | 228.036 | - | 228.036 |

Change Summary Explanation

FY 2022 funding reduction reflects Congressional mark due to Integration Previously Funded.

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 0607139A / Improved Turbine Engine Program | | | | Project (Number/Name) ES6 / Improved Turbine Engine Program | | | |
| 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 |
| ES6: Improved Turbine Engine Program | - | 232.159 | 260.024 | 228.036 | - | 228.036 | 205.191 | 133.473 | 111.068 | 69.591 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This funding line is a key enabler of the army Modernization Priorities in support of the Improved Turbine Engine Program (ITEP). ITEP develops, tests, qualifies, and integrates the next generation turboshaft engine on Future Attack Reconnaissance Aircraft (FARA), Black Hawk and Apache aircraft. The Improved Turbine Engine (ITE) replaces the existing T700 engine design originated in the 1970's and meets the operational requirement of 6,000 feet pressure altitude and 95 degrees (6K/95). The ITE will fit inside the existing engine bays of the Black Hawk and Apache Helicopters and provides a significant power enhancement of up to fifty percent (total of 3,000 class shaft horsepower) with increased fuel efficiency. Additional benefits include improved design life, enhanced reliability, lower maintenance cost and restored capability lost due to aircraft weight growth without an increase to the logistics footprint. The program consists of systems engineering and program management, detailed design engineering, design assurance, hardware manufacturing and testing, component and module level development and testing, system level testing and qualification, and platform integration and qualification.

FY 2021 funding completed Apache Incremental Critical Design Review #1 (iCDR), completed Black Hawk Integrated Baseline Review (IBR), completed the Live Fire Test Design Plan, continues the engine OEM EMD effort begun in FY 2019, continues engine component testing leading to First Engine To Test (FETT), began Preliminary Flight Rating (PFR) test planning, began physical airframe integration, initiated Apache A-Kit iCDR #2, and initiated Black Hawk A-Kit PDR. FY 2022 funding will continue PFR testing leading to a Preliminary Flight Rated engine in FY 2023, continues physical airframe integration, and continues Live Fire detailed test planning, completes Apache A-Kit iCDR #2, completes Black Hawk A-Kit PDR, and initiates Black Hawk A-Kit CDR. FY 2023 funding provides for completion of Black Hawk A-Kit CDR, completion of Live Fire detailed test planning, initiation of aircraft flight/qualification testing, and the initiation of engine full qualification testing. FY 2024 funding provides for continuation of aircraft flight/qualification testing, completion of Live Fire static engine tests, completion of engine qualification, and initiation of work to prepare for the Live Fire dynamic engine tests. FY 2025 funding provides for completion of Live Fire dynamic engine tests, continuation of flight/qualification testing, beginning of Low Rate Initial Production (LRIP), execution of Initial Operational Test and Evaluation (IOTE), beginning engine integration and A-kit development for the H-60V platform, and initiation of work to prepare for the Live Fire platform level testing (as needed). FY 2026 funding provides for H-60V A-kit CDR, and begins physical airframe integration. FY 2027 funding provides for continued H-60V physical integration and begins flight testing.

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

| | | | |
|--|----------------|----------------|----------------|
| | FY 2021 | FY 2022 | FY 2023 |
| Title: ITEP | 232.159 | 250.533 | 228.036 |
| Description: ITEP - a multi-platform turbine engine development required across existing Army aircraft to fill the capability gaps for Army Aviation Operations | | | |
| FY 2022 Plans: | | | |

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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 0607139A / Improved Turbine Engine Program | Project (Number/Name) ES6 / Improved Turbine Engine Program | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2021 | FY 2022 | FY 2023 |
| <p>FY 2022 funding will begin PFR testing, leading to a Preliminary Flight Rated engine in FY 2023, complete Apache A-Kit iCDR #2, complete Black Hawk A-Kit PDR, initiate Black Hawk A-Kit CDR, continue physical airframe integration, and continue Live Fire detailed test planning.</p> <p>FY 2023 Plans: FY 2023 funding provides for completion of Black Hawk A-Kit CDR, completion of Live Fire detailed test planning, initiation of aircraft flight/qualification testing, and the initiation of engine full qualification testing.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decrease from FY 2022 to FY 2023 due to completion of First Engine to Test (FETT).</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> | | - | 9.491 | - |
| Accomplishments/Planned Programs Subtotals | | 232.159 | 260.024 | 228.036 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| For FY 2014 and prior, all funding for ITEP was contained in Program Element (PE) 0203744A - Aircraft Modifications/Product Improvement Programs, Project 504. FY 2015 funding was initially moved to PE 0203744A, Project EB1. Prior to execution, FY 2015 and beyond funding was moved to to PE 0607139A, Project ES6. | | | | |
| D. Acquisition Strategy | | | | |
| Following a successful Milestone B decision, a cost-plus-incentive-fee contract was awarded to General Electric for EMD contractual effort in FY 2019. | | | | |
| ITEP Platform Integration Trade Studies Contracts were awarded to the Boeing Company and the Sikorsky Corporation in FY 2015. In FY 2019, two follow-on efforts were awarded to design and develop A-kits to integrate the ITE into both the Apache and Black Hawk platforms. Following a successful Apache A-Kit iCDR in FY 2021 and FY 2022, and Black Hawk A-Kit CDR in FY2023, the integration efforts will continue to include fabrication of the A-kits, flight test support, and pubs/provisioning. | | | | |
| Upon completion of EMD, an LRIP contract will be awarded in FY 2025. | | | | |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army **Date:** April 2022

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| Appropriation/Budget Activity 2040 / 7 | R-1 Program Element (Number/Name) PE 0607139A / Improved Turbine Engine Program | Project (Number/Name) ES6 / Improved Turbine Engine Program |
|--|---|---|

| 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 |
| ITEP SEPM - Organic | Allot | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 45.462 | 9.550 | Nov 2020 | 9.749 | Oct 2021 | 9.881 | Oct 2022 | - | | 9.881 | Continuing | Continuing | Continuing |
| ITEP SEPM - Contractor | C/IDIQ | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 17.757 | 3.608 | Nov 2020 | 3.878 | Oct 2021 | 3.975 | Oct 2022 | - | | 3.975 | Continuing | Continuing | Continuing |
| ITEP SEPM - OGA | MIPR | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 20.641 | 2.215 | Oct 2020 | 2.365 | Oct 2021 | 2.425 | Oct 2022 | - | | 2.425 | Continuing | Continuing | Continuing |
| SBIR/STTR Transfer | TBD | Army : TBD | - | - | | 9.491 | Mar 2022 | - | | - | | - | 0.000 | 9.491 | - |
| Subtotal | | | 83.860 | 15.373 | | 25.483 | | 16.281 | | - | | 16.281 | Continuing | Continuing | 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 |
| Engine OEM EMD Contract | C/CPIF | General Electric Company (GE) : Lynn, MA | 254.167 | 148.495 | Nov 2020 | 131.914 | Oct 2021 | 85.905 | Oct 2022 | - | | 85.905 | Continuing | Continuing | Continuing |
| Platform Integration and Qualification Contracts | SS/CPIF | The Boeing Company, The Sikorsky | 58.468 | 42.019 | Apr 2021 | 71.697 | Jan 2022 | 93.662 | Oct 2022 | - | | 93.662 | Continuing | Continuing | Continuing |

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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 0607139A / Improved Turbine Engine Program | | | | ES6 / Improved Turbine Engine Program | | | | | | | |
| 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 |
| | | Corporation : Phoenix, AZ, Stratford, CT | | | | | | | | | | | | | |
| Subtotal | | | 312.635 | 190.514 | | 203.611 | | 179.567 | | - | | 179.567 | Continuing | Continuing | 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 |
| ITEP Engineering Support - Organic | Allot | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 0.835 | 0.182 | Oct 2020 | 0.186 | Oct 2021 | 0.189 | Oct 2022 | - | | 0.189 | Continuing | Continuing | Continuing |
| ITEP Engineering Support - Contractor | C/IDIQ | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 10.780 | 2.729 | Oct 2020 | 2.894 | Oct 2021 | 2.966 | Oct 2022 | - | | 2.966 | Continuing | Continuing | Continuing |
| ITEP Engineering Support - OGA | MIPR | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 29.637 | 11.119 | Nov 2020 | 12.405 | Oct 2021 | 12.510 | Oct 2022 | - | | 12.510 | Continuing | Continuing | Continuing |
| Platform Integration Support | MIPR | Program Management Office (PMO) Apache and Black Hawk Project | 3.765 | 5.955 | Oct 2020 | 6.075 | Oct 2021 | 6.196 | Oct 2022 | - | | 6.196 | Continuing | Continuing | Continuing |

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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 0607139A / Improved Turbine Engine Program | | | | ES6 / Improved Turbine Engine Program | | | | | | | |
| 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 |
| | | Offices : Redstone Arsenal, AL | | | | | | | | | | | | | |
| Subtotal | | | 45.017 | 19.985 | | 21.560 | | 21.861 | | - | | 21.861 | Continuing | Continuing | N/A |
| Test and Evaluation (\$ 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 |
| Government Test Planning/Flight Test Support and Analysis | SS/TBD | Program Management Office (PMO) Aviation Turbine Engines Project Office (ATE), Various : Redstone Arsenal, AL | 0.624 | 6.287 | Oct 2020 | 9.370 | Oct 2021 | 10.327 | Oct 2022 | - | | 10.327 | Continuing | Continuing | Continuing |
| Subtotal | | | 0.624 | 6.287 | | 9.370 | | 10.327 | | - | | 10.327 | Continuing | Continuing | N/A |
| Project Cost Totals | | | 442.136 | 232.159 | | 260.024 | | 228.036 | | - | | 228.036 | Continuing | Continuing | N/A |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army | | Date: April 2022 |
| Appropriation/Budget Activity 2040 / 7 | R-1 Program Element (Number/Name) PE 0607139A / Improved Turbine Engine Program | Project (Number/Name) ES6 / Improved Turbine Engine Program |

| Event Name | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | | FY 2026 | | | | FY 2027 | | | |
|---|------------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ITEP Systems Engineering/Program Management | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone C | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering & Manufacturing Development | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Air Vehicle Integration | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Testing | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| First Engine To Test (FETT) | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preliminary Flight Rating | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Low Rate Initial Production (LRIP) | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Full Rate Production | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IOC | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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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 0607139A / Improved Turbine Engine Program | Project (Number/Name) ES6 / Improved Turbine Engine Program |

Schedule Details

| Events | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| ITEP Systems Engineering/Program Management | 1 | 2015 | 4 | 2030 |
| Milestone C | 1 | 2025 | 1 | 2025 |
| Engineering & Manufacturing Development | 2 | 2019 | 1 | 2025 |
| Critical Design Review (CDR) | 4 | 2020 | 4 | 2020 |
| Air Vehicle Integration | 2 | 2019 | 4 | 2030 |
| Testing | 2 | 2019 | 2 | 2026 |
| First Engine To Test (FETT) | 2 | 2022 | 2 | 2022 |
| Preliminary Flight Rating | 1 | 2024 | 1 | 2024 |
| Low Rate Initial Production (LRIP) | 1 | 2025 | 4 | 2026 |
| Full Rate Production | 1 | 2027 | 4 | 2037 |
| IOC | 4 | 2027 | 4 | 2027 |