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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army **Date:** February 2018

| Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army</i> / BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i> | | | | | R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i> | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
| Total Program Element | - | 0.000 | 20.000 | 95.085 | 23.000 | 118.085 | 102.806 | 122.558 | 267.217 | 255.788 | Continuing | Continuing |
| FI4: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i> | - | 0.000 | 20.000 | 95.085 | 23.000 | 118.085 | 102.806 | 122.558 | 267.217 | 255.788 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Army has a need to improve capabilities to defend maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require improved air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aerial Systems (UAS) and Rocket Artillery and Mortar (RAM) threats.

This additional capability will be provided through a multi-phase approach that enables rapid fielding of an initial capability, culminating in a program of record that will field a full capability. Initially, the Army will field an interim M-SHORAD solution using an Army Senior Leader Directed Requirement, informed by an FY 2017 M-SHORAD Demonstration. The system or system-of-systems solution will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include Fixed Wing (FW), Rotary Wing (RW), and Group 1 - 3 Unmanned Aircraft Systems (UAS) while keeping pace and surviving with the maneuver Brigades. This interim solution will be fielded in up to three M-SHORAD battalions. The objective solution is needed to counter FW, RW, UAS, and indirect fires (RAM) threats. Both mounted and dismounted capabilities are required. As part of the objective solution, the 50 kilowatt laser will be assessed for possible transition from Science Technology to an objective M-SHORAD program in FY2022.

FY 2019 base and OCO dollars in the amount of \$118.085 million will continue the interim M-SHORAD capability development and integration of the identified solution into existing maneuver formation equipment. Efforts will include: complete fabrication of production representative articles; begin testing to achieve Urgent Materiel Release; and continue the development and finalization of the required program documentation.

Additionally, FY2019 funds will continue development of an objective M-SHORAD Family of Systems, to include: complete the objective M-SHORAD Family of Systems Analysis of Alternatives (AoA); complete development and approval of all Milestone A documentation; begin Concept Design Development for all M-SHORAD Family of Systems variants, and continue Contract Package development.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army | | | | Date: February 2018 | |
| Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P) | | R-1 Program Element (Number/Name) PE 0604117A / Short Range Air Defense (M-SHORAD) | | | |
| B. Program Change Summary (\$ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
| Previous President's Budget | 0.000 | 20.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 20.000 | 95.085 | 23.000 | 118.085 |
| Total Adjustments | 0.000 | 0.000 | 95.085 | 23.000 | 118.085 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Adjustments to Budget Years | - | - | 95.085 | 23.000 | 118.085 |
| Change Summary Explanation | | | | | |
| FY2019 increases of \$95.085 (Base) and \$23.000M (OCO) were due to the realignment of funding from PE0604319A Project DU3 Indirect Fire Protection Capability Increment 2-Intercept (IFPC2). | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | | | | | | | | | Date: February 2018 | | |
|---|-------------|---------|---------|--------------|---|---------------|---------|---------|--|---------------------|------------------|------------|
| Appropriation/Budget Activity 2040 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604117A / Short Range Air Defense (M-SHORAD) | | | | Project (Number/Name) FI4 / Maneuver - Short Range Air Defense (M-SHORAD) | | | |
| COST (\$ in Millions) | Prior Years | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
| FI4: Maneuver - Short Range Air Defense (M-SHORAD) | - | 0.000 | 20.000 | 95.085 | 23.000 | 118.085 | 102.806 | 122.558 | 267.217 | 255.788 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Army has a need to improve capabilities to defend maneuver formations and other tactical echelons from low altitude air attack and surveillance. Adaptive threats have developed a suite of airborne threat capabilities, supported by an integrated mix of surface-to-air and surface-to-surface shooters that threaten the ability of maneuver forces to conduct operations. Specifically, maneuver formations require improved air defense identification and defeat capabilities to counter Fixed Wing (FW), Rotary Wing (RW), Unmanned Aerial Systems (UAS) and Rocket Artillery and Mortar (RAM) threats.

This additional capability will be provided through a multi-phase approach that enables rapid fielding of an initial capability, culminating in a program of record that will field a full capability. Initially, the Army will field an interim M-SHORAD solution using an Army Senior Leader Directed Requirement, informed by an FY 2017 M-SHORAD Demonstration. The system or system-of-systems solution will provide the capability to identify, track, and neutralize or destroy low-altitude air threats to include Fixed Wing (FW), Rotary Wing (RW), and Group 1 - 3 Unmanned Aircraft Systems (UAS) while keeping pace and surviving with the maneuver Brigades. This interim solution will be fielded in up to three M-SHORAD battalions. The objective solution is needed to counter FW, RW, UAS, and indirect fires (RAM) threats. Both mounted and dismounted capabilities are required. As part of the objective solution, the 50 kilowatt laser will be assessed for possible transition from Science and Technology to an objective M-SHORAD program in FY2022.

FY 2019 base dollars in the amount of \$95.085 million and FY 2019 OCO dollars in the amount of \$23.000 million will continue the interim M-SHORAD capability development and integration of the identified solution into existing maneuver formation equipment. Efforts will include: complete fabrication of production representative articles; begin testing to achieve Urgent Materiel Release; and continue the development and finalization of the required program documentation. Additionally, FY2019 funds will continue development of an objective M-SHORAD Family of Systems, to include: complete the objective M-SHORAD Family of Systems Analysis of Alternatives (AoA); complete development and approval of all Milestone A documentation; begin Concept Design Development for all M-SHORAD Family of Systems variants, and continue Contract Package development.

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

| | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Interim Solution Materiel Development/Integration | - | 15.000 | 85.085 | 23.000 | 108.085 |
| Description: Funding is provided for the following efforts: | | | | | |
| FY 2018 Plans: | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | | | Date: February 2018 | | |
| Appropriation/Budget Activity 2040 / 4 | | R-1 Program Element (Number/Name) PE 0604117A / Short Range Air Defense (M-SHORAD) | | Project (Number/Name) FI4 / Maneuver - Short Range Air Defense (M-SHORAD) | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
| <p>- Leveraged information gathered during the Maneuver - Short Range Air Defense (M-SHORAD) Demonstration to begin hardware/software modifications and integration of sensors and defeat mechanisms based on the Directed Requirement.</p> <p>- Prepared and approved the Demonstration Report</p> <p>- Formed the interim M-SHORAD team</p> <p>- Prepared documentation including the Acquisition Strategy, System Engineering Plan, Test and Evaluation Master Plan, Life-Cycle Sustainment Plan, and Information Support Plan.</p> <p>- Continued development of the Contract requirements</p> <p>- Began the fabrication of production representative articles for testing purposes.</p> <p>FY 2019 Base Plans:</p> <p>- Complete fabrication of production representative articles</p> <p>- Begin testing to achieve Urgent Materiel Release</p> <p>- Continue the development and finalization of the required program documentation</p> <p>FY 2019 OCO Plans:</p> <p>- Complete fabrication of production representative articles</p> <p>- Begin testing to achieve Urgent Materiel Release</p> <p>- Continue the development and finalization of the required program documentation</p> <p>FY 2018 to FY 2019 Increase/Decrease Statement:</p> <p>The increase supports the cost of prototypes and testing in FY2019.</p> | | | | | | |
| <p>Title: Objective Family of Systems Development/Integration</p> <p>Description: Funding is provided for the following efforts:</p> <p>FY 2018 Plans:</p> <p>- Began Product Office staffing</p> <p>- Began Contract Package development</p> <p>- Developed the Analysis of Alternatives (AoA) Study Guidance and Plan</p> <p>- Began development of the objective M-SHORAD Family of Systems AoA.</p> <p>- Funded the Validated On-Line Life-Cycle Threat (VOLT)</p> <p>- Conducted Market Research</p> <p>- Conducted the Affordability Analysis</p> <p>- Conducted the objective M-SHORAD Milestone Development Decision</p> | | - | 5.000 | 10.000 | - | 10.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | | | Date: February 2018 | |
| Appropriation/Budget Activity 2040 / 4 | | R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i> | | Project (Number/Name) FI4 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i> | |

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|---|----------------|----------------|---------------------|--------------------|----------------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
| <p>- Began development of the Milestone A Regulatory and Statutory documentation to include the Acquisition Strategy, Clinger-Cohen Act Compliance, Concept of Operations/Operational Mode Summary/Mission Profile, Core Logistics Determination/Core Logistics and Sustaining Workloads Estimate, Cyber Security Strategy, Life-Cycle Cost Estimate, and Life-Cycle Sustainment Plan</p> <p><i>FY 2019 Base Plans:</i></p> <ul style="list-style-type: none"> - Conduct activities in support of the Materiel Solutions Analysis Phase (pre-Milestone A) - Continue Contract Package development - Complete the objective M-SHORAD Family of Systems AoA - Complete development and approval of all Milestone A Regulatory and Statutory documentation - Begin Concept Design Development for all M-SHORAD Family of Systems variants <p><i>FY 2018 to FY 2019 Increase/Decrease Statement:</i> The increase supports the initiation of the Materiel Solutions Phase.</p> | | | | | |
| Accomplishments/Planned Programs Subtotals | - | 20.000 | 95.085 | 23.000 | 118.085 |

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|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
| Line Item | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
| • CE8710: AVENGER MODS | 35.979 | 62.931 | 48.670 | - | 48.670 | 86.807 | 165.928 | 454.994 | 291.600 | 0.000 | 1,146.909 |
| Remarks M-SHORAD procurement is funded through CE8710 (FY2020-FY2023). | | | | | | | | | | | |
| D. Acquisition Strategy Multi-phase approach using the Maneuver Short Range Air Defense (M-SHORAD) Demonstration as the initial basis to identify near-term interim solutions. The acquisition strategy is to use an Other Transactional Authority (OTA) contract for the purchase of 12 interim solution prototypes according to the content of the directed requirement. The objective M-SHORAD Family of Systems Product Office sought a Materiel Development Decision in 2QFY2018. The M-SHORAD Family of Systems Product Office plans to conduct a Milestone A and award funds in 2QFY2020 for the competitive development of each M-SHORAD variant with a demonstration of variants from multiple vendors during Technology Maturation and Risk Reduction with a down-select in FY2021. Milestone B is planned for 2QFY2022. | | | | | | | | | | | |
| E. Performance Metrics N/A | | | | | | | | | | | |

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|---|-----------------------------------|--|--------------------|----------------|-------------------|--|-------------------|---------------------|-------------------|--------------------|-------------------|---|-------------------------|-------------------|---------------------------------|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army | | | | | | | | | | | | Date: February 2018 | | | |
| Appropriation/Budget Activity 2040 / 4 | | | | | | R-1 Program Element (Number/Name) PE 0604117A / Short Range Air Defense (M-SHORAD) | | | | | | Project (Number/Name) FI4 / Maneuver - Short Range Air Defense (M-SHORAD) | | | |
| Management Services (\$ in Millions) | | | | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 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 |
| Product Management | PO | Trident, Intuitive Research and others : Huntsville, Alabama | - | - | | 2.255 | | 3.095 | Mar 2018 | - | | 3.095 | Continuing | Continuing | Continuing |
| Subtotal | | | - | - | | 2.255 | | 3.095 | | - | | 3.095 | Continuing | Continuing | N/A |
| Product Development (\$ in Millions) | | | | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 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 |
| System Engineering and Integration | C/CPIF | TBD : TBD | - | - | | 1.517 | | 6.522 | Jun 2019 | - | | 6.522 | Continuing | Continuing | Continuing |
| Engineering and Technical Support | MIPR | Aviation and Missiles Research Development and Engineering Center : Redstone Arsenal, AL | - | - | | 0.491 | | 3.010 | Jun 2019 | - | | 3.010 | Continuing | Continuing | Continuing |
| System Development and Integration | C/CPIF | TBD : TBD | - | - | | 13.171 | | 69.821 | Jun 2019 | 23.000 | Jun 2019 | 92.821 | Continuing | Continuing | Continuing |
| Subtotal | | | - | - | | 15.179 | | 79.353 | | 23.000 | | 102.353 | Continuing | Continuing | N/A |
| Support (\$ in Millions) | | | | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 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 |
| Support Costs | MIPR | Aviation and Missiles Command (AMCOM) : Redstone Arsenal, AL | - | - | | 0.758 | | 3.960 | Mar 2018 | - | | 3.960 | Continuing | Continuing | Continuing |
| Subtotal | | | - | - | | 0.758 | | 3.960 | | - | | 3.960 | Continuing | Continuing | N/A |

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army | | | | | | | | | | | | Date: February 2018 | | | |
| Appropriation/Budget Activity 2040 / 4 | | | | | | R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i> | | | | | | Project (Number/Name) FI4 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i> | | | |
| Test and Evaluation (\$ in Millions) | | | | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 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 |
| Developmental Testing | MIPR | Redstone Test Center (RTC) and White Sands Missile Range (WSMR) : Redstone, AL and WSMR, NM | - | - | | 0.671 | | 3.586 | Oct 2018 | - | | 3.586 | Continuing | Continuing | Continuing |
| Test Support | MIPR | RTC, WSMR, Target Management Office and others : Redstone, AL and WSMR, NM | - | - | | 1.137 | | 5.091 | Oct 2018 | - | | 5.091 | Continuing | Continuing | Continuing |
| Subtotal | | | - | - | | 1.808 | | 8.677 | | - | | 8.677 | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 Total | Cost To Complete | Total Cost | Target Value of Contract |
| Project Cost Totals | | | - | - | | 20.000 | | 95.085 | | 23.000 | | 118.085 | Continuing | Continuing | N/A |
| Remarks | | | | | | | | | | | | | | | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army

Date: February 2018

Appropriation/Budget Activity

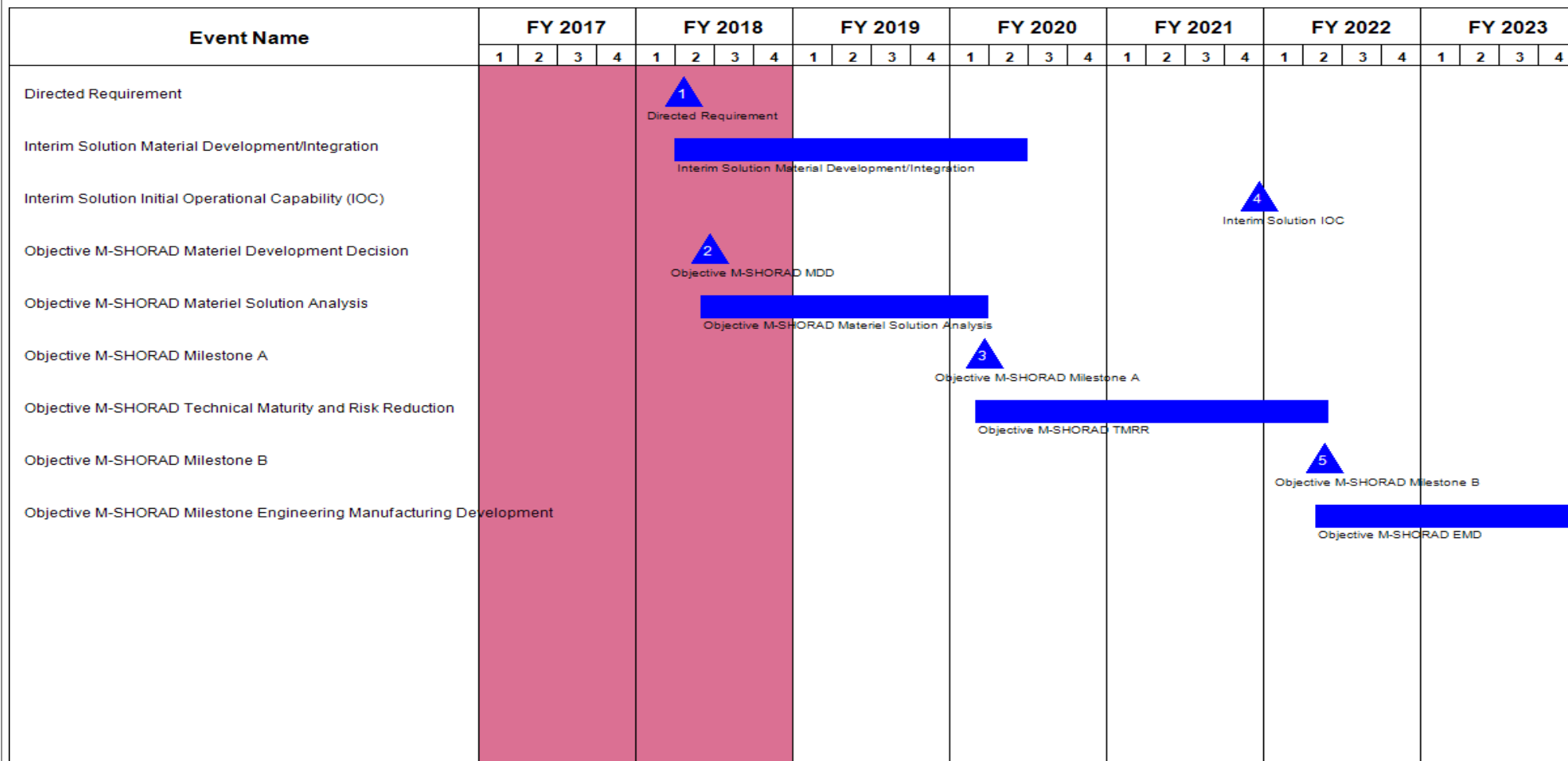
2040 / 4

R-1 Program Element (Number/Name)

PE 0604117A / Short Range Air Defense
(M-SHORAD)

Project (Number/Name)

F14 / Maneuver - Short Range Air Defense
(M-SHORAD)



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| Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army | | | Date: February 2018 |
| Appropriation/Budget Activity 2040 / 4 | R-1 Program Element (Number/Name) PE 0604117A / <i>Short Range Air Defense (M-SHORAD)</i> | Project (Number/Name) F14 / <i>Maneuver - Short Range Air Defense (M-SHORAD)</i> | |

Schedule Details

| Events | Start | | End | |
|--|----------------|-------------|----------------|-------------|
| | Quarter | Year | Quarter | Year |
| Directed Requirement | 2 | 2018 | 2 | 2018 |
| Interim Solution Material Development/Integration | 2 | 2018 | 2 | 2020 |
| Interim Solution Initial Operational Capability (IOC) | 4 | 2021 | 4 | 2021 |
| Objective M-SHORAD Materiel Development Decision | 2 | 2018 | 2 | 2018 |
| Objective M-SHORAD Materiel Solution Analysis | 2 | 2018 | 1 | 2020 |
| Objective M-SHORAD Milestone A | 1 | 2020 | 1 | 2020 |
| Objective M-SHORAD Technical Maturity and Risk Reduction | 1 | 2020 | 2 | 2022 |
| Objective M-SHORAD Milestone B | 2 | 2022 | 2 | 2022 |
| Objective M-SHORAD Milestone Engineering Manufacturing Development | 2 | 2022 | 4 | 2024 |