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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force **Date:** May 2021

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i> | R-1 Program Element (Number/Name) PE 0603601F / <i>Conventional Weapons Technology</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2020 | FY 2021 | FY 2022 Base | FY 2022 OCO | FY 2022 Total | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 202.048 | 133.900 | 157.423 | 0.000 | 157.423 | - | - | - | - | - | - |
| 63670A: <i>Weapon Technology Development</i> | - | 57.895 | 0.000 | 55.278 | 0.000 | 55.278 | - | - | - | - | - | - |
| 63670B: <i>Weapon Concept Development</i> | - | 144.153 | 133.900 | 102.145 | 0.000 | 102.145 | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

This project develops, integrates, and demonstrates advanced ordnance and guidance technologies for air-launched conventional weapons. The effort focuses on conventional ordnance component technologies such as warheads, fuzes, and explosives, as well as munition guidance component technologies such as navigation and control systems and seekers. Technologies to be developed, demonstrated, and integrated into system concepts will address blast, fragmentation, penetration, low collateral damage, variable depth/location fuzing, precise guidance, and high-performance and insensitive explosives. Efforts in this project have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

The Department of the Air Force technologies in this program are both enabling and enduring as we invest in maturing emerging technologies that address established mission gaps, and transformational technologies that address integrated enterprise capabilities intended to reshape the future force across air, space, and cyber warfighting domains. Development of transformational operational capabilities through advanced technology solutions focuses on five strategic capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, and Mass; and Speed and Reach of Disruption and Lethality.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science and technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

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| B. Program Change Summary (\$ in Millions) | FY 2020 | FY 2021 | FY 2022 Base | FY 2022 OCO | FY 2022 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 225.817 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 202.048 | 133.900 | 157.423 | 0.000 | 157.423 |
| Total Adjustments | -23.769 | 133.900 | 157.423 | 0.000 | 157.423 |
| • Congressional General Reductions | 0.000 | -0.245 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 134.145 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -7.604 | 0.000 | | | |
| • Other Adjustments | -16.165 | 0.000 | 157.423 | 0.000 | 157.423 |

Change Summary Explanation

FY 2021 and 2022: Congressional directed realignment due to reversal of program element restructure.

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| Appropriation/Budget Activity 3600 / 3 | | | | | R-1 Program Element (Number/Name) PE 0603601F / <i>Conventional Weapons Technology</i> | | | | Project (Number/Name) 63670A / <i>Weapon Technology Development</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2020 | FY 2021 | FY 2022 Base | FY 2022 OCO | FY 2022 Total | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Cost To Complete | Total Cost |
| 63670A: <i>Weapon Technology Development</i> | - | 57.895 | 0.000 | 55.278 | 0.000 | 55.278 | - | - | - | - | - | - |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project develops, matures, assesses, and demonstrates advanced/innovative ordnance and guidance component and subsystem technologies for air-launched conventional weapons. The project focuses on maturation of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

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

| | FY 2020 | FY 2021 | FY 2022 |
|---|----------------|----------------|----------------|
| Title: Ordnance Technologies | 29.582 | 0.000 | 27.082 |
| <p>Description: Develop and demonstrate integrated ordnance technologies to improve conventional air-delivered munitions. Specific technical areas of focus include energetic materials, fuze technology, warhead sciences, and modeling and simulation tools.</p> <p>FY 2021 Plans: Complete joint technology demonstration for dialable effects technologies. Continue to demonstrate distributed, embedded fuzing concepts for close-controlled strike, area attack, and penetration applications such as layer counting at high speed, including assessing long-term safety, survivability, and functionality. Continue development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and high-fidelity analysis tools to generate more accurate, faster-running weaponing data. Continue to develop ordnance technologies/methodologies for high-speed impact and functional defeat. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for weapons and improve lethality and survivability tools at the meso-scale and micro-scale. Continue to mature research on distributed, collaborative, cooperative effects munition technologies. Continue the development of high-fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Continue incorporation of previously developed material models and improve/advance additional joint kinetic/directed energy common target models. Continue synthesis and incorporation of warhead models for progressive collapse, multiple point initiation, secondary debris and others.</p> <p>FY 2022 Plans: Continue to demonstrate distributed, embedded fuzing concepts for close-controlled strike, area attack, and penetration applications such as layer counting at high-speed, including assessing long-term safety, survivability, and functionality. Continue</p> | | | |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2020 | FY 2021 | FY 2022 |
|--|----------------|----------------|----------------|
| <p>development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and high-fidelity analysis tools to generate more accurate, faster-running weaponeering data. Continue to develop ordnance technologies/methodologies for high-speed impact and functional defeat. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for weapons and improve lethality and survivability tools at the meso-scale and micro-scale. Continue to mature research on distributed, collaborative and cooperative effects munition technologies. Continue the development of high-fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Continue incorporation of previously developed material models and improve/advance additional joint kinetic/directed energy common target models. Continue synthesis and incorporation of warhead models for progressive collapse, multiple point initiation, secondary debris and other models.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$27.082 million. Funding increased in FY 2022 due to the Weapon Technology Development Project funding being inadvertently recorded in the Weapon Concept Development Project in FY 2021.</p> | | | |
| <p>Title: Guidance Technologies</p> <p>Description: Develop guidance technologies to improve the precision, controlled lethality, and flexibility of conventional, air-delivered munitions. Specific technical areas include precision navigation and terminal seekers.</p> <p>FY 2021 Plans: Continue integration of hardware-in-the-loop, software-in-the-loop, and other Modeling and Simulation technologies for the demonstration of open architecture, high-speed, cooperative, and modular munition concepts. Continue the design and development of seeker subsystem prototypes for platform self-defense. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software defined radio frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Continue providing multi-security level, cross-domain distributed Modeling and Simulation support for munition research using distributed connectivity between multiple Eglin Air Force Base facilities. Begin integration of lethality models into guidance and control simulation to enhance weapon integrated performance. Begin development of sensor test technologies to enable verification of autonomous munition concepts. Initiate the integration of higher fidelity constructive analysis tools with engagement and mission level Modeling and Simulation.</p> <p>FY 2022 Plans:</p> | 28.313 | 0.000 | 28.196 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2020 | FY 2021 | FY 2022 |
|---|----------------|----------------|----------------|
| <p>Continue integration of hardware-in-the-loop, software-in-the-loop, and other modeling and simulation technologies for the demonstration of open architecture, high-speed, networked, collaborative and autonomous, and modular munition concepts. Continue the design and development of seeker sub-system prototypes for platform self-defense. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software-defined radio frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Continue providing multi-security level, cross-domain distributed modeling and simulation support for munition research using distributed connectivity between Eglin Air Force Base facilities and other geographic locations. Continue integrating lethality models into guidance and control simulations to enhance weapon integrated performance. Continue development of sensor test technologies to enable verification of autonomous munition concepts. Continue integrating higher fidelity constructive analysis tools with engagement and mission level modeling and simulation. Initiate miniature munition technology integration for ground launch demonstration.</p> <p><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> FY 2022 increased compared to FY 2021 by \$28.196 million. Funding increased in FY 2022 due to the Weapon Technology Development Project funding being inadvertently recorded in the Weapon Concept Development Project in FY 2021.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 57.895 | 0.000 | 55.278 |

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

N/A

Remarks

D. Acquisition Strategy

N/A

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| Appropriation/Budget Activity 3600 / 3 | | | | | R-1 Program Element (Number/Name) PE 0603601F / <i>Conventional Weapons Technology</i> | | | | Project (Number/Name) 63670B / <i>Weapon Concept Development</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2020 | FY 2021 | FY 2022 Base | FY 2022 OCO | FY 2022 Total | FY 2023 | FY 2024 | FY 2025 | FY 2026 | Cost To Complete | Total Cost |
| 63670B: <i>Weapon Concept Development</i> | - | 144.153 | 133.900 | 102.145 | 0.000 | 102.145 | - | - | - | - | - | - |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project develops, refines, integrates, demonstrates, and assesses ordnance and guidance technologies to reduce risk for potential air-launched conventional weapons acquisitions. The project concentrates in two effort areas, Air-to-Air Concept Development and Air-to-Ground Concept Development. The project focuses on risk reduction of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

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

| | FY 2020 | FY 2021 | FY 2022 |
|--|----------------|----------------|----------------|
| Title: Air-to-Air Concept Development | 69.707 | 64.968 | 43.790 |
| Description: Mature, integrate, and demonstrate air-to-air weapon components and systems to include ordnance, guidance, and carriage and release technologies to demonstrate war-fighter capability. | | | |
| FY 2021 Plans: | | | |
| Continue developing the technology trade space to enable air-to-air weapons with robust capability in the future threat environment, including technologies for efficient propulsion, high lethality, efficient flight / high agility, miniaturization, and cost and risk reduction for both offensive and defensive purposes. Continue to develop and test prototype propulsion systems with flexibility to enable more adaptable next generation air-to-air weapons. Continue to conduct lethality studies to enable design of small form factor warheads lethal against the 2030 plus target set. Transition advanced target models to other AF and DoD offices. Continue to develop preliminary design of air-to-air weapon concepts for sixth generation platforms. Continue to document missile flight dynamics trade space and conduct wind-tunnel experiments to characterize airframes and validate aerodynamic codes leading to development of highly maneuverable and efficient missiles to counter advanced targets, and improve persistence and survivability of future platforms. Continue to conduct ground and arena tests of advanced weapons experimental carriages for sixth generation weapon concept and prepare for flight worthiness testing. Continue to mature simulation architectures to assess the trade and synergies between kinetic and directed energy weapons. Continue to perform experiments with small warheads to obtain data for lethality analysis to validate and improve designs. Continue to plan and execute integrated subsystem | | | |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2020 | FY 2021 | FY 2022 |
|--|----------------|----------------|----------------|
| <p>experiments. Complete self defense munition maturation of hardware and software elements, integrate, assemble and test the complete munition.</p> <p>FY 2022 Plans: Continue developing the technology trade space to enable air-to-air weapons with robust capability in the future threat environment, including technologies for efficient propulsion, high lethality, efficient flight, high agility, miniaturization, as well as cost and risk reduction for both offensive and defensive purposes. Continue to develop and test prototype propulsion systems with flexibility to enable more adaptable next generation air-to-air weapons. Continue to conduct lethality studies to enable design of small form factor warheads lethal against the 2030 plus target set. Transition advanced target models to other AF and DoD offices. Continue to develop preliminary design of air-to-air weapon concepts for sixth generation platforms. Continue to document missile flight dynamics trade space. Continue to conduct wind-tunnel experiments to characterize airframes and validate aerodynamic codes leading to development of highly maneuverable and efficient missiles to counter advanced targets, and improve persistence and survivability of future platforms. Continue to conduct ground and arena tests of advanced weapons experimental carriages for sixth generation weapon concept and prepare for flight worthiness testing. Continue to mature simulation architectures to assess the trade and synergies between kinetic and directed energy weapons. Continue to perform experiments with small warheads to obtain data for lethality analysis to validate and improve designs. Continue to plan and execute integrated sub-system experiments. Initiate miniature munition ground launch demonstration. Initiate modeling, simulation, analysis, and digital engineering in support of air-to-air advanced weapon technologies.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$21.178 million. Funding decreased in FY 2022 due to the Weapon Technology Development Project funding being inadvertently recorded in the Weapon Concept Development Project in FY 2021.</p> | | | |
| <p>Title: Air-to-Ground Concept Development</p> <p>Description: Mature, integrate, and demonstrate air-to-ground weapon components and systems (ordnance, guidance, and carriage and release technologies) to demonstrate war-fighter capability.</p> <p>FY 2021 Plans: Complete hypersonic boost glide testing. Initiate expanded integration of collaborative weapon technology onto additional weapon systems. Continue system integration of algorithms and software defined radios onto pathfinder weapon system to enable synchronized collaborative weapon effects. Continue planning and technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and cooperative/collaborative concepts). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to develop kinetic/non-kinetic payloads, seeker, and fuze technology for hypersonic applications.</p> <p>FY 2022 Plans:</p> | 74.446 | 68.932 | 47.768 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2020 | FY 2021 | FY 2022 |
| <p>Continue expanded integration of collaborative weapon technology onto additional weapon systems. Complete exploring the algorithms and software defined radios for networked, collaborative, and autonomous weapon effects. Continue planning efforts for technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and cooperative/collaborative concepts). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to develop kinetic/non-kinetic payloads, seeker, and fuze technology for hypersonic applications. Initiate modeling, simulation, analysis, and digital engineering in support of air-to-ground advanced weapon technologies.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$21.164 million. Funding decreased in FY 2022 due to the Weapon Technology Development Project funding being inadvertently recorded in the Weapon Concept Development Project in FY 2021.</p> | | | | |
| <p>Title: Transformational Component</p> <p>Description: This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority</p> <p>FY 2021 Plans: Not Applicable.</p> <p>FY 2022 Plans: Initiate transformational efforts to address weapons capability gaps.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY22 increased compared to FY21 by \$10.587 million. Funding is increased due to initiation of this effort to increased emphasis in Transformational Technology Development projects.</p> | | 0.000 | 0.000 | 10.587 |
| Accomplishments/Planned Programs Subtotals | | 144.153 | 133.900 | 102.145 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| D. Acquisition Strategy | | | | |
| N/A | | | | |