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

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>
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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	-	124.025	155.306	187.374	0.000	187.374	226.278	245.965	250.584	256.136	Continuing	Continuing
63670A: <i>Weapon Technology Development</i>	-	0.000	55.278	56.569	0.000	56.569	63.909	83.630	80.657	82.497	Continuing	Continuing
63670B: <i>Weapon Concept Development</i>	-	124.025	100.028	130.805	0.000	130.805	162.369	162.335	169.927	173.639	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops, integrates, and demonstrates advanced ordnance and guidance technologies for 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 & technology capabilities. The use of such program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602605F, 0602788F, 0602298F, and 0602020F.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
Previous President's Budget	133.900	157.423	0.000	0.000	0.000
Current President's Budget	124.025	155.306	187.374	0.000	187.374
Total Adjustments	-9.875	-2.117	187.374	0.000	187.374
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-2.117			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-4.509	0.000			
• Other Adjustments	-5.366	0.000	187.374	0.000	187.374

**Change Summary Explanation**

Decrease in FY 2021 reflects reprogramming to support Research and Development Projects, 10 U.S.C. Section 2363, an amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B).

FY 2021 and 2022: Congressional directed realignment due to reversal of program element restructure. The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY 2023 cannot be made in a relevant manner.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force										<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>				<b>Project (Number/Name)</b> 63670A / <i>Weapon Technology Development</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63670A: <i>Weapon Technology Development</i>	-	0.000	55.278	56.569	0.000	56.569	63.909	83.630	80.657	82.497	Continuing	Continuing
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 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)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Ordnance Technologies	0.000	27.082	27.728
<b>Description:</b> Develop and demonstrate integrated ordnance technologies to improve conventional munitions. Specific technical areas of focus include energetic materials, fuze technology, warhead sciences, and modeling and simulation tools.			
<b>FY 2022 Plans:</b> 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 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.			
<b>FY 2023 Plans:</b> Continue to demonstrate advanced distributed, embedded fuzing concepts, including assessing long-term safety, survivability, and functionality. Continue advanced development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature advanced ordnance technologies for rapid transition into high-speed strike weapon concepts,			

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<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>	<b>Project (Number/Name)</b> 63670A / <i>Weapon Technology Development</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and high-fidelity analysis tools to quickly generate more accurate weaponing data. Continue to develop advanced ordnance technologies for high-speed impact. Continue to develop advanced ordnance technologies/methodologies for functional defeat. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for weapons and lethality/survivability tools at the meso/micro-scale. Complete 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><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 increased compared to FY 2022 by \$0.646 million. Justification for increase is described in the plans above.</p>			
<p><b>Title:</b> Guidance Technologies</p> <p><b>Description:</b> Develop guidance technologies to improve the precision, controlled lethality, and flexibility of conventional munitions. Specific technical areas include precision navigation and terminal seekers.</p> <p><b>FY 2022 Plans:</b> 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><b>FY 2023 Plans:</b> 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, development, and evaluation of seeker sub-system prototypes for platform self-defense. Continue</p>	0.000	28.196	28.841

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>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 improving multi-security level, cross-domain distributed modeling and simulation for munition research using distributed connectivity between Eglin Air Force Base facilities and other geographic locations. Continue integrating higher-fidelity lethality models into guidance and control simulations to enhance weapon integrated performance. Complete 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. Continue miniature munition technology integration for ground launch demonstration. Initiate design and development of a weapons digital ecosystem that enables digital engineering and the use of high-fidelity digital twinning across the weapons lifecycle.</p> <p><b><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i></b> FY 2023 increased compared to FY 2022 by \$0.645 million. Justification for increase is described in the plans above.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	55.278	56.569

<p><b>C. Other Program Funding Summary (\$ in Millions)</b> N/A</p> <p><b>Remarks</b></p> <p><b>D. Acquisition Strategy</b> Not applicable.</p>
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<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63670B: <i>Weapon Concept Development</i>	-	124.025	100.028	130.805	0.000	130.805	162.369	162.335	169.927	173.639	Continuing	Continuing
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 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)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Air-to-Air Concept Development	60.030	43.790	42.284
<b>Description:</b> 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.			
<b>FY 2022 Plans:</b> 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			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>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><b>FY 2023 Plans:</b> 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 analysis to enable design of small form factor warheads lethal against the 2030 plus target set. Continue to 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. Complete 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. Continue miniature munition ground launch demonstration. Continue modeling, simulation, analysis, and digital engineering in support of air-to-air advanced weapon technologies.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$1.506 million. Funding decreased due to higher Air Force priorities for investigating transformational technologies.</p>			
<p><b>Title:</b> Air-to-Ground Concept Development</p> <p><b>Description:</b> 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><b>FY 2022 Plans:</b> 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,</p>	63.995	47.768	45.765

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>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><b>FY 2023 Plans:</b> Complete integration of collaborative weapon technology onto additional weapon systems. Continue planning efforts for technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and high-speed concepts). Complete 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. Continue modeling, simulation, analysis, and digital engineering in support of air-to-ground advanced weapon technologies.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$2.003 million. Funding decreased due to higher Air Force priorities for investigating transformational technologies.</p>			
<p><b>Title:</b> Transformational Component</p> <p><b>Description:</b> Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through ordnance and guidance technologies. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.</p> <p><b>FY 2022 Plans:</b> Initiate transformational efforts to address weapons capability gaps.</p> <p><b>FY 2023 Plans:</b> Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process.</p>	0.000	8.470	42.756

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
Continue to develop and demonstrate a capability for high speed delivery of area effects. Continue to develop and enable multi-domain sense-making at the tactical edge				
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 increased compared to FY 2022 by \$34.286 million. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.				
<b>Accomplishments/Planned Programs Subtotals</b>		124.025	100.028	130.805
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>D. Acquisition Strategy</b>				
Not applicable.				