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

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</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	0.000	53.026	12.886	106.826	0.000	106.826	19.222	0.000	0.000	0.000	0.000	191.960
645341: <i>Direct Strike Penetrator Systems</i>	0.000	53.026	12.886	106.826	0.000	106.826	19.222	0.000	0.000	0.000	0.000	191.960
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Direct Strike Penetrator Systems program develops and modifies a family of advanced precision-guided penetrator munitions to include evaluation of integrated technologies for the development/integration of advanced position, navigation, and timing (PNT) capabilities (i.e., Global Positioning System (GPS), non-GPS, optical, passive, active, etc.) and smart fuze systems, and all penetrator components, that will provide the Air Force with improved ability to attack Hard and Deeply Buried Targets (HDBT), such as bunker and tunnel facilities, using air-to-surface conventional munitions. Systems developed include, but are not limited to Massive Ordnance Penetrator (MOP), GBU-72 Advanced 5,000-lb Penetrator Weapon System (A5K), and Section 804 Rapid Prototype/Rapid Fielding activities. Systems developed will be integrated onto current and future platforms to reduce the number of weapons required to hold HDBTs at risk and will result in more targets engaged per mission flown. Direct Strike Penetrators will provide critical global strike capability not met by inventory conventional weapons and will hold at risk the best protected high value assets essential to an enemy's war fighting ability. The project also provides an opportunity to quickly insert emerging technologies into existing and developing aircraft munitions and fuzes.

A Hard Target Munitions (HTM) Analysis-of-Alternatives (AoA) was conducted in 2014 to determine the best weapons and/or development efforts for addressing the HDBT mission area. The HTM AoA determined that it was necessary to develop a family of HTMs in order to apply effects to the entire range of HDBT sets. The Air Force is using the AoA to develop, produce and modify HDBT weapons identified as the most effective and affordable. Modeling and simulation is used to assess and characterize current inventory and to drive design and explore the utility of new classes of penetrator munitions.

This requirement supports performance of a full financial audit as required by title 10 U.S.C. Chapter 9A, Sec 240-D.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY21 \$1.434M was expended for civilian pay expenses in this program element, and in FY22 \$0.192M is forecasted for civilian pay expenses in this program element.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0604327F I Hard and Deeply Buried Target Defeat System (HDBTDS) Program
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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	52.825	15.886	0.000	0.000	0.000
Current President's Budget	53.026	12.886	106.826	0.000	106.826
Total Adjustments	0.201	-3.000	106.826	0.000	106.826
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-3.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	2.000	0.000			
• SBIR/STTR Transfer	-1.799	0.000			
• Other Adjustments	0.000	0.000	106.826	0.000	106.826

Change Summary Explanation

FY22 Congressional mark of -\$3M for unexecuted prior year balances

The FY2022 President's Budget submittal did not reflect FY2023 through FY2026 funding. Therefore, an explanation of the change between the two budget positions for FY2023 cannot be made in a relevant manner.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
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Title: Massive Ordnance Penetrator (MOP) Modification	23.292	4.647	105.758
Description: Modify the Massive Ordnance Penetrator (MOP) weapon for enhanced capability to hold additional Hard and Deeply Buried Targets at risk in multiple Combatant Commands (COCOMs). The modification will be primarily software-based and the existing inventory of Guided Bomb Unit (GBU)-57E/B will be retrofitted. Construct relevant hard and deeply buried targets for testing. Execute MOP testing in support of modification efforts to included sub-scale and full-scale ground and flight tests. Analyze MOP weapon effectiveness.			
FY 2022 Plans: Continue long-lead target build and test & evaluation of MOP Modification for enhanced capability.			
FY 2023 Plans: Continue long-lead target build and test & evaluation of MOP Modification for enhanced capability as well as accuracy enhancement effort to hold hard and deeply buried targets at risk.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604327F <i>I Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Funds increased to execute full test program that includes constructing complex and relevant hard and deeply buried targets for testing. Increase also supports development and test of accuracy enhancements.				
Title: Advanced 5,000 lb (A5K) Penetrator		28.332	8.239	1.068
Description: GBU-72 Advanced 5,000 lb (A5K) Penetrator is an improved 5,000 lb class penetrator to address capability gaps identified in the HTM AoA. Conduct A5K design, development, integration, modeling and simulation, and testing to improve performance against increasingly hardened targets. This effort utilizes existing and improved technologies to field an integrated penetrator weapon system to include: an improved penetrator warhead, a smart fuze system that can detect layers/voids, and a modified Joint Direct Attack Munition (JDAM) tail kit for all weather, precision guidance, navigation, and control.				
FY 2022 Plans: Integration, modeling and simulation, and testing to improve performance against increasingly hardened targets.				
FY 2023 Plans: Continuation to support the finalization of DT/OT testing, remediation activities, integration, and modeling/simulation to improve the performance against increasingly hardened targets for the Advanced 5,000 pound (A5K) Penetrator weapon system.				
FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased due to reduced RDT&E activity as A5K approaches EMD completion and transition to production in FY23.				
Title: Military Code (M-Code) and Enhanced Anti-Jam (EAJ)		1.402	0.000	0.000
Description: M-Code and EAJ provides the capability to operate in increasing adversarial anti-access/area denial (A2/AD) jamming environments. M-Code and EAJ also provide increased accuracy, better signal acquisition, and advanced security.				
FY 2022 Plans: N/A				
FY 2023 Plans: N/A				
FY 2022 to FY 2023 Increase/Decrease Statement: N/A				
Accomplishments/Planned Programs Subtotals		53.026	12.886	106.826

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

<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• PAAF 01 353190: <i>Massive Ordnance Penetrator (MOP)</i>	-	15.500	19.743	0.000	19.743	13.979	8.420	-	-	Continuing	Continuing
• PAAF 01 353020: <i>General Purpose Bombs</i>	369.566	176.565	156.385	0.000	156.385	135.827	133.749	164.925	168.420	Continuing	Continuing
• RDTE 05 0604602F: <i>Armament/ Ordnance Development</i>	20.199	9.047	5.279	0.000	5.279	6.973	7.102	7.254	7.415	Continuing	Continuing
• RDTE 05 0604618F: <i>Joint Direct Attack Munition</i>	6.555	0.000	0.000	0.000	0.000	-	-	-	-	0.000	6.555
• RDTE 04 0604201F: <i>PNT Resiliency</i>	-	39.742	12.010	0.000	12.010	-	-	-	-	0.000	51.752

Remarks

E. Acquisition Strategy

MOP uses sole source cost type contracts to complete development, test, and evaluation activities.

M-Code/EAJ effort uses a Family of Systems approach where the three prime weapons contractors develop receivers capable of operating in any of their AF weapons. The receivers are based on a common, internally-developed interface requirements specification, technology requirement document, and threat scenario. This approach uses a combination of contract types based on acquisition phase (Technology Maturation and Risk Reduction, Development, Production) and risk. The Weapons System Program Offices share a common development program element to allow flexibility in funding and planning, switching to individual PEs for receiver integration, operational test, and production. The M-Code/EAJ Weapons Receiver Development effort leverages technology currently under development by the GPS-Directorate Military GPS User Equipment program and will provide the warfighter with unmatched capability to operate in future A2/AD environments.

The initial GBU-72/A5K penetrator design was accomplished through modeling, simulation, and analysis producing potential designs. The designs were developed based on the performance parameters of survivability, lethality, accuracy and penetration. The Government determined the optimum A5K design to then manufacture production representative prototypes to include warheads, fuzes and modified JDAM kits. These assets will be used to conduct and successfully complete qualification testing and integration.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY21 \$1.434M was expended for civilian pay expenses in this program element, and in FY22 \$0.192M is forecasted for civilian pay expenses in this program element.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force												Date: April 2022			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3600 / 4				PE 0604327F / Hard and Deeply Buried Target Defeat System (HDBTDS) Program				645341 / Direct Strike Penetrator Systems							
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
MOP Modification and Integration	SS/ Various	Boeing : St Louis, MO	0.000	7.503	Nov 2021	2.000	Jun 2022	-		-		-	Continuing	Continuing	-
Subtotal			0.000	7.503		2.000		-		-		-	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
MOP System Contractor Support	MIPR	DOTC : Albuquerque, NM	0.000	1.723	Sep 2021	0.000	Sep 2022	-		-		-	Continuing	Continuing	-
A5K System T&E Contractor Support	MIPR	DOTC/ARA/NGIS : Albuquerque, NM	0.000	2.462	Dec 2021	0.162	May 2022	-		-		-	0.000	2.624	-
A5K System T&E Government Support	MIPR	MCAAP : McAlester, OK	0.000	1.082	Nov 2021	0.331	Nov 2022	-		-		-	0.000	1.413	-
DCA Civ Pay	Allot	AFLCMC/EBD : Eglin AFB, FL	0.000	1.434	Oct 2020	0.192	Oct 2021	-		-		-	0.000	1.626	-
Subtotal			0.000	6.701		0.685		-		-		-	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
MOP Test & Evaluation	Various	AFLCMC : Eglin, Holloman, Edw, FL	0.000	0.991	Feb 2021	1.000	Sep 2022	25.634	Dec 2022	-		25.634	Continuing	Continuing	-
MOP Target Construction and Instrumentation	Various	DTRA : Albuquerque, NM	0.000	12.364	Sep 2021	1.255	Mar 2023	76.904	Jan 2023	-		76.904	Continuing	Continuing	-
A5K Developmental Test & Evaluation	Various	96 TW, 780 TS : Eglin, Holloman, FL	0.000	10.818	Jul 2022	6.000	Jul 2022	0.508	Jan 2023	-		0.508	0.000	17.326	-
A5K Operational Test & Evaluation	Various	96 TW, Det 1 : Eglin, WSMR, FL	0.000	11.964	Jun 2022	1.461	Dec 2022	0.416	May 2023	-		0.416	0.000	13.841	-
Subtotal			0.000	36.137		9.716		103.462		-		103.462	Continuing	Continuing	N/A

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Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
MOP Program Management Administration (PMA)	Various	AFCLCMC/EBD : Eglin AFB, FL	0.000	0.586	Oct 2020	0.200	Mar 2022	3.220	Oct 2022	-		3.220	Continuing	Continuing	-
A5K Program Management Administration (PMA)	Various	AFCLCMC/EBD : Eglin AFB, FL	0.000	2.049	Oct 2020	0.285	Mar 2022	0.144	Jan 2023	-		0.144	0.000	2.478	-
M-Code Program Management Administration (PMA)	Various	AFCLCMC/EBD : Eglin AFB, FL	0.000	0.050	Oct 2020	-		-		-		-	0.000	0.050	-
Subtotal			0.000	2.685		0.485		3.364		-		3.364	Continuing	Continuing	N/A

Remarks
Program Management Administration (PMA) funding increased to support additional MOP Modification testing activities.

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	53.026	12.886	106.826	-	106.826	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i>	Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i>

	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

<i>Direct Strike Penetrator Systems</i>	
MOP Modification Analysis and Testing	[REDACTED]
A5K Design, Development and Testing	[REDACTED]
M-Code/EAJ Development/Integration	[REDACTED]

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i>	Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Direct Strike Penetrator Systems</i>				
MOP Modification Analysis and Testing	1	2021	4	2025
A5K Design, Development and Testing	1	2021	4	2024
M-Code/EAJ Development/Integration	1	2021	4	2021

Note
M-code will be fielded through the individual A5K and MOP procurement funding lines.