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Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Missile Defense Agency **Date:** March 2024

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>
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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	506.530	16.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	522.530
MD98: <i>Directed Energy Demonstrator Development</i>	506.530	16.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	522.530

Program MDAP/MAIS Code: 362

Note

N/A. No funding is requested for this program in FY 2025 and the outyears.

A. Mission Description and Budget Item Justification

Technology Maturation Initiatives (TMI) demonstrates the utility of directed energy for missile defense. The Missile Defense Agency's (MDA) directed energy plan incrementally demonstrates and improves the constituent components required to execute a directed energy acquisition, tracking, and lethality kill chain. The directed energy effort advances the technology readiness levels of emerging and developing technologies, while simultaneously assessing the performance and contributions to the Missile Defense System architecture. TMI included analysis, development, demonstration, systems engineering and test efforts to examine, develop, and improve directed energy systems, disruptive directed energy concepts, sensors, and future missile defense technologies.

Directed Energy Demonstrator Development addressed technology risk reduction and maturation for high powered strategic lasers, beam control, lethality, and related technologies. The efforts remain tightly coupled with Office of the Undersecretary of Defense Research and Engineering (OUSD(R&E)) High Energy Laser Development Road Map, and are essential to mature strategic laser technology.

MDA collaborates with the Combatant Commands, Defense Advanced Research Projects Agency, Department of Energy, Joint Directed Energy Transition Office, Military Departments, National Laboratories and OUSD(R&E) in a systems engineering based strategy to research, analyze, develop and test directed energy weapons technology.

MDA continues to participate in the Department's Directed Energy Reviews.

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B. Program Change Summary (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	16.000	0.000	0.000	-	0.000
Current President's Budget	16.000	0.000	0.000	-	0.000
Total Adjustments	0.000	0.000	0.000	-	0.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• 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	0.000	0.000			
• Other Adjustment	0.000	0.000	0.000	-	0.000

Change Summary Explanation

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Missile Defense Agency **Date:** March 2024

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>	Project (Number/Name) MD98 / <i>Directed Energy Demonstrator Development</i>
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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
<i>MD98: Directed Energy Demonstrator Development</i>	506.530	16.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	522.530
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

N/A. No funding is requested for this program in FY 2025 and the outyears.

A. Mission Description and Budget Item Justification

The Directed Energy Demonstrator Development (DEDD) project develops, integrates, and tests the component technologies required to scale electric lasers to hundreds of kilowatts. Laser scaling focused on maturing laser capability to levels sufficient to enter into the Office of the Undersecretary of Defense Research and Engineering High Energy Laser Road Map efforts. The DEDD project provided the necessary technology, test data, and operations familiarity to successfully transition to a higher power directed energy weapon. MDA continues to participate in the Department's Directed Energy Reviews.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2023	FY 2024	FY 2025
Title: Directed Energy Demonstrator Development	16.000	0.000	0.000
Articles:	-	-	-
Description: Laser scaling develops, integrates, and tests the component technologies required for scaling electric lasers while maintaining optimal size, weight, and power metrics and near diffraction limited beam quality.			
FY 2024 Plans: - No funding is requested in FY 2024 for this effort			
FY 2025 Plans: N/A			
FY 2024 to FY 2025 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	16.000	0.000	0.000

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Missile Defense Agency		Date: March 2024
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>	Project (Number/Name) MD98 / <i>Directed Energy Demonstrator Development</i>

D. Acquisition Strategy

Employ various contracting strategies in a flexible manner to maximize the contribution to MDA. Execute through utilization of small businesses, leverage the Nation's engineering centers of excellence (Federally Funded Research and Development Centers and University Affiliated Research Centers); generate cooperatives with other Government Agencies to provide concept modeling and assessment capability. This strategy uses agency and partner subject matter experts and government model-based assessments to inform Better Buying Power acquisition decisions.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2025 Missile Defense Agency													Date: March 2024		
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)						
0400 / 4				PE 0604115C / Technology Maturation Initiatives					MD98 / Directed Energy Demonstrator Development						
Product Development (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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			
Directed Energy Demonstrator Development - Adaptive Optics Effectiveness Demonstration	C/CPFF	Various : Various	9.000	0.000		0.000		0.000		-		0.000	0.000	9.000	0.000
Directed Energy Demonstrator Development - Beam Control and Lethality Demonstration	C/CPFF	Multi : Multi	27.561	0.000		0.000		0.000		-		0.000	0.000	27.561	0.000
Directed Energy Demonstrator Development - Directed Energy CPU	Various	Various : Various	0.000	3.395	May 2023	0.000		0.000		-		0.000	0.000	3.395	0.000
Directed Energy Demonstrator Development - Industry Laser Scaling and Technology Transfer	C/CPFF	Boeing : CA	18.412	0.000		0.000		0.000		-		0.000	0.000	18.412	0.000
Directed Energy Demonstrator Development - LPLD Preliminary Design A	C/CPFF	Lockheed Martin : CA	40.494	0.000		0.000		0.000		-		0.000	0.000	40.494	0.000
Directed Energy Demonstrator Development - LPLD Preliminary Design B	C/CPFF	General Atomics : CA	36.841	0.000		0.000		0.000		-		0.000	0.000	36.841	0.000
Directed Energy Demonstrator Development - LPLD Preliminary Design C	C/CPFF	Boeing : CA	36.361	0.000		0.000		0.000		-		0.000	0.000	36.361	0.000
Directed Energy Demonstrator Development - LPLD	C/CPFF	Lockheed Martin : CA	26.000	0.000		0.000		0.000		-		0.000	0.000	26.000	0.000

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Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
0400 / 4				PE 0604115C / Technology Maturation Initiatives				MD98 / Directed Energy Demonstrator Development							
Product Development (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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 Critical Design A (CPU)															
Directed Energy Demonstrator Development - LPLD System Critical Design B (CPU)	C/CPFF	General Atomics : CA	26.000	0.000		0.000		0.000		-		0.000	0.000	26.000	0.000
Directed Energy Demonstrator Development - LPLD System Critical Design C (CPU)	C/CPFF	Boeing : CA	26.000	0.000		0.000		0.000		-		0.000	0.000	26.000	0.000
Directed Energy Demonstrator Development - Laser Lethality Demonstration	C/CPFF	General Atomics, AFRL, Redstone Testing Center, White Sands Missile Range : CA, AL, NM	11.378	0.000		0.000		0.000		-		0.000	0.000	11.378	0.000
Directed Energy Demonstrator Development - Laser Scaling	C/Various	MIT LL, LLNL : MA, CA	136.658	0.000		0.000		0.000		-		0.000	0.000	136.658	0.000
Directed Energy Demonstrator Development - Laser Scaling - Diode Pumped Alkali Laser (CPU)	MIPR	LLNL (Lawrence Livermore National Laboratory) : CA	47.400	3.156	Apr 2023	0.000		0.000		-		0.000	0.000	50.556	0.000
Directed Energy Demonstrator Development - Laser Scaling - Diode Pumped Alkali Laser (CPU) Contract	C/CPFF	LOCKHEED MARTIN CORPORATION : Various	0.000	3.844	Jan 2024	0.000		0.000		-		0.000	0.000	3.844	0.000
Directed Energy Demonstrator	C/Various	Various : Various	2.500	0.000		0.000		0.000		-		0.000	0.000	2.500	0.000

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Product Development (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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			
Development - Machine Learning Adaptive Optics															
Directed Energy Demonstrator Development - Microwave Technology Assessment	C/CPFF	RAYTHEON : AZ	5.500	0.000		0.000		0.000		-		0.000	0.000	5.500	0.000
Directed Energy Demonstrator Development - Performance Analysis	MIPR	MIT LL, Aviation and Missile Research Development and Engineering Center (AMRDEC), Combat Capabilities Development Command - Aviation and Missile Center (CCDC-AMC), AFRL, USAFA, Semquest : MA, AL, NM, CO	12.469	0.000		0.000		0.000		-		0.000	0.000	12.469	0.000
Directed Energy Demonstrator Development - Short Pulsed Laser Lethality Assessment	C/CPFF	UNIVERSITY OF ROCHESTER : NY	9.000	5.605	Jun 2023	0.000		0.000		-		0.000	0.000	14.605	9.000
Directed Energy Demonstrator Development - Technology Transfer/Component Development	C/CPIF	Boeing : CA	16.209	0.000		0.000		0.000		-		0.000	0.000	16.209	0.000
Subtotal			487.783	16.000		0.000		0.000		-		0.000	0.000	503.783	N/A

Remarks
N/A

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Support (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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			
Directed Energy Demonstrator Development - Advisory and Assistance Services	Allot	MDA Multi : AL, NM	8.013	0.000		0.000		0.000		-		0.000	0.000	8.013	0.000
Directed Energy Demonstrator Development - Engineering and Technical Services	MIPR	Aviation and Missile Research Development and Engineering Center (AMRDEC), Combat Capabilities Development Command - Aviation and Missile Center (CCDC-AMC) : AL	2.221	0.000		0.000		0.000		-		0.000	0.000	2.221	0.000
Directed Energy Demonstrator Development - FFRDC	FFRDC	Aerospace : AL, NM	3.317	0.000		0.000		0.000		-		0.000	0.000	3.317	0.000
Directed Energy Demonstrator Development - Facility Support	MIPR	377th ABW, Phoenix : NM	0.483	0.000		0.000		0.000		-		0.000	0.000	0.483	0.000
Directed Energy Demonstrator Development - Facility Sustainment	C/CPFF	Multi : AL, NM	1.281	0.000		0.000		0.000		-		0.000	0.000	1.281	0.000
Directed Energy Demonstrator Development - Information Technology	C/CPFF	Northrop Grumman, Jacobs Technology : CO	3.282	0.000		0.000		0.000		-		0.000	0.000	3.282	0.000
Directed Energy Demonstrator Development - Travel	Allot	MDA Multi : AL, NM	0.150	0.000		0.000		0.000		-		0.000	0.000	0.150	0.000
Subtotal			18.747	0.000		0.000		0.000		-		0.000	0.000	18.747	N/A

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Support (\$ in Millions)				FY 2023		FY 2024		FY 2025 Base		FY 2025 OCO		FY 2025 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			

Remarks
N/A

	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	506.530	16.000	0.000	0.000	-	0.000	0.000	522.530	N/A

Remarks
N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2025 Missile Defense Agency **Date:** March 2024

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>	Project (Number/Name) MD98 / <i>Directed Energy Demonstrator Development</i>
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	FY 2023			FY 2024			FY 2025			FY 2026			FY 2027			FY 2028			FY 2029		
	◆	◆	◆																		
Laser Scaling Development - Diode Pumped Alkali Laser (DPAL) Continued	◆	◆	◆																		
Optimize laser performance	◆	◆	◆																		
Studies for transition of technology from the Laboratory to Industry	◆	◆	◆																		

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Exhibit R-4A, RDT&E Schedule Details: PB 2025 Missile Defense Agency		Date: March 2024
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>	Project (Number/Name) MD98 / <i>Directed Energy Demonstrator Development</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Laser Scaling Development - Diode Pumped Alkali Laser (DPAL) Continued	2	2023	4	2023
Optimize laser performance	2	2023	4	2023
Studies for transition of technology from the Laboratory to Industry	2	2023	4	2023