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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

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 0604032F / <i>Directed Energy Prototyping</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	48.316	44.000	20.964	0.000	20.964	10.983	19.970	3.993	3.994	0.000	152.220
640200: <i>DE Prototyping</i>	-	48.316	44.000	20.964	0.000	20.964	10.983	19.970	3.993	3.994	0.000	152.220
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Directed Energy Prototyping Program integrates, demonstrates, evaluates, and prototypes high energy laser, high power microwave and other electromagnetic radiation or particle beam technologies. This Program addresses capability needs in airbase defense, precision strike and aircraft protect capabilities. The Directed Energy Prototyping Program bridges the gap between lab based technology demonstration under a controlled environment, and demonstration of a system in realistic environments with the intent of establishing successful acquisition, and operation or operational capability implementation.

This prototyping effort enables the ability to integrate the prototype systems with other operational systems required for the mission, conduct test and evaluation activities, and modify emerging directed energy technology systems based on prototyping activities to enable rapid fielding to the warfighter. The Directed Energy Prototyping Program allows acquisition program managers (capability developers) and warfighters (capability recipients and end users) to prototype, integrate, evaluate, and demonstrate candidate weapon technologies and assess them in an operational environment in partnership with Program Executive officers, schoolhouses, simulation facilities, major commands, combatant commands, and developmental planning organizations.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Directed Energy Prototyping weapon systems. It may also include necessary civilian pay expenses required to perform analysis and developmental activities required in support of the transition of weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	50.000	10.000	15.000	0.000	15.000
Current President's Budget	48.316	44.000	20.964	0.000	20.964
Total Adjustments	-1.684	34.000	5.964	0.000	5.964
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	34.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.684	0.000			
• Other Adjustments	0.000	0.000	5.964	0.000	5.964

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 640200: *DE Prototyping*

Congressional Add: *Program Increase - Directed Energy Prototyping*

Congressional Add: *Program increase - Counter-UAS targeting solution*

Congressional Add: *Unfunded Requirement*

Congressional Add Subtotals for Project: 640200

Congressional Add Totals for all Projects

	FY 2019	FY 2020
	48.316	0.000
	0.000	14.000
	0.000	20.000
Congressional Add Subtotals for Project: 640200	48.316	34.000
Congressional Add Totals for all Projects	48.316	34.000

Change Summary Explanation

Increase in FY 2021 of \$5.964 million due to additional emphasis on the acceleration of developing high power microwave counter-unmanned aerial system enhancements.

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

	FY 2019	FY 2020	FY 2021
Title: Directed Energy Capabilities	0.000	10.000	20.964
Description: Prototypes and evaluates Directed energy weapon technologies for Airbase Defense against unmanned aerial vehicles and cruise missiles, Precision Strike against electronic and conventional targets and Aircraft Defense against incoming threats.			
FY 2020 Plans:			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Obtain High Energy Laser and High Power Microwave counter-unmanned aerial system prototypes currently available and evaluate them for mission effectiveness, time to field, logistics, and deployment requirements. These assets will be made available for test by the Directed Energy Prototyping Program, the Joint Directed Energy Test Center, White Sands Missile Range or other Air Force agency or Command. May conduct additional Directed Energy Prototyping work as directed by Air force senior leadership.</p> <p>FY 2021 Plans: Continue to test and evaluate acquired systems to determine operational effectiveness. Results from operational testing will be used to consider program initiation. Opening operating location at Kirtland Air Force Base to support transition, test, and evaluation of directed energy technologies.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$10.964 million. Funding increased due to additional emphasis on the acceleration of high power microwave counter-unmanned aerial system enhancements and evaluations of high energy laser system operational effectiveness.</p>			
Accomplishments/Planned Programs Subtotals	0.000	10.000	20.964

	FY 2019	FY 2020
<p>Congressional Add: Program Increase - Directed Energy Prototyping</p> <p>FY 2019 Accomplishments: Conducted Congressionally directed efforts.</p> <p>FY 2020 Plans: Not applicable.</p>	48.316	0.000
<p>Congressional Add: Program increase - Counter-UAS targeting solution</p> <p>FY 2019 Accomplishments: Not applicable.</p> <p>FY 2020 Plans: Conduct Congressional directed efforts.</p>	0.000	14.000
<p>Congressional Add: Unfunded Requirement</p> <p>FY 2019 Accomplishments: Not applicable.</p> <p>FY 2020 Plans: Conduct Congressional directed efforts.</p>	0.000	20.000
Congressional Adds Subtotals	48.316	34.000

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

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D. Other Program Funding Summary (\$ in Millions)		
Remarks N/A		
E. Acquisition Strategy The Directed Energy Prototyping events have resulted in eight (8) systems considered for prototyping from Raytheon, Boeing, Lockheed Martin, ATA, Kord, and one (1) government system. With FY 2019 funding, four (4) Operational Prototype systems have been acquired based on technical maturity to test, three (3) high energy laser systems and one (1) high power microwave system. Overseas field assessments of the (4) four directed energy systems and extensive market research are being used to inform a competitive down selection in 2nd Quarter FY 2020 of additional directed energy systems, with a contract award in 3rd Quarter FY 2020. Build and operational test systems will be sourced from a consortium of 600+ vendors. Award(s) will be made with Other Transaction Authority based on a best value determination with Technical being the most important factor. Proposed system(s) will be technically assessed for effectiveness, time to field, maintenance, and sustainability. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Program Development & Integration Directorate, Wright-Patterson Air Force Base, Ohio.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
3600 / 4				PE 0604032F / Directed Energy Prototyping				640200 / DE Prototyping								
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
Directed Energy Airbase Defense Prototypes	C/Various	Various : Various	-	43.316	Sep 2019	8.000	May 2020	8.964	Nov 2020	-		8.964	Continuing	Continuing	-	
Congressional Add: Program Increase Counter-UAS targeting solution	TBD	Not specified. : TBD	-	-		14.000	Sep 2020	-		-		-	0.000	14.000	-	
Congressional Add: Unfunded Requirement	TBD	Not specified. : TBD	-	-		20.000	Sep 2020	-		-		-	0.000	20.000	-	
Subtotal			-	43.316		42.000		8.964		-		8.964	Continuing	Continuing	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
Directed Energy Airbase Defense Prototyping and Operational Testing	Various	Various : Various	-	0.000		0.000		10.000	Jun 2021	-		10.000	Continuing	Continuing	-	
Subtotal			-	0.000		0.000		10.000		-		10.000	Continuing	Continuing	N/A	
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
Directed Energy Prototyping Program Administration	Various	AFLCMC : Various	-	5.000	Dec 2018	2.000	Oct 2019	2.000	Oct 2020	-		2.000	Continuing	Continuing	-	
Subtotal			-	5.000		2.000		2.000		-		2.000	Continuing	Continuing	N/A	
Project Cost Totals			-	48.316		44.000		20.964		-		20.964	Continuing	Continuing	N/A	

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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks
 FY 2021 - FY 2025 will concentrate on prototyping high energy laser and high power microwave systems for base area defense in preparation for transition to program of record. The program will make max use of Other Transactional Authorities (OTA) in anticipation of vendor selection within in FY 2020. Continued support will be provided to the recently established Directed Energy Transition Management Office, Kirtland Air Force Base, New Mexico supporting location.

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i>	Project (Number/Name) 640200 / <i>DE Prototyping</i>
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	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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>Operational Prototypes</i>	
System Acquisition	██████████
Competitive Downselect and test	████████████████████
<i>Build and operational test</i>	
Initial build and test	██

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i>	Project (Number/Name) 640200 / <i>DE Prototyping</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Operational Prototypes</i>				
System Acquisition	1	2019	3	2019
Competitive Downselect and test	4	2019	3	2020
<i>Build and operational test</i>				
Initial build and test	3	2020	4	2022

Note

FY 2021 - FY 2025 will concentrate on prototyping high energy laser and high power microwave systems for base area defense in preparation for transition to program of record. The program will make max use of Other Transactional Authorities (OTA) in anticipation of vendor selection within in FY 2020. Continued support will be provided to the recently established Directed Energy Transition Management Office, Kirtland Air Force Base, New Mexico supporting location.