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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 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</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	104.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
644860: <i>Operational Energy and Installation Resilience</i>	-	0.000	104.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**  
Although FY 2022 funding for the Operational Energy program is within this program element per congressional direction, due to the timing of the FY 2023 President's Budget submission and the signing of the FY 2022 Appropriations bill, Operational Energy funding for FY 2023 and beyond is currently documented in the Tech Transition Program (0604858F).

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

The Operational Energy and Installation Resilience program develops, matures, prototypes, and demonstrates technologies and processes focused in two areas: decreasing operational energy risk and increasing installation resilience. The Air Force is DOD's largest consumer of operational energy, and also requires resilient installations to execute its missions. Technology transition and process integration efforts with a focus in these areas enable the Air Force to optimize operational energy use for maximum combat capability, and mitigate multi-domain energy threats to installations. The objective of this program is to prioritize, validate, and implement solutions to that end.

In similar manner to the Tech Transition Program (0604858F), the Operational Energy and Installation Resilience program allows acquisition program managers and warfighters to prototype, demonstrate, and transition candidate technologies and processes, including assessments in operationally relevant environments.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY2021 \$0 was expended for civilian pay expenses in this program element, In FY 2022, no more than 3% of the total program element funds will be used for this purpose.

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>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	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	104.000	0.000	0.000	0.000
Total Adjustments	0.000	104.000	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	70.000			
• Congressional Directed Transfers	0.000	34.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

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

**Project:** 644860: *Operational Energy and Installation Resilience*

Congressional Add: *Program Increase - Energy and Climate Resilience*

Congressional Add Subtotals for Project: 644860

Congressional Add Totals for all Projects

	<b>FY 2021</b>	<b>FY 2022</b>
	0.000	70.000
Congressional Add Subtotals for Project: 644860	0.000	70.000
Congressional Add Totals for all Projects	0.000	70.000

**Change Summary Explanation**

In addition to the 70M congressional add, the FY22 appropriations bill also directed transfer of 34M for Operational Energy efforts from the Tech Transition Program (0604858F) to this new program element. In addition, although FY 2022 funding for the Operational Energy program is within this program element per congressional direction, due to the timing of the FY 2023 President's Budget submission and the signing of the FY 2022 Appropriations bill, Operational Energy funding for FY 2023 and beyond is currently documented in the Tech Transition Program (0604858F).

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
<b>Title:</b> Operational Energy	-	34.000	0.000	0.000	0.000
<b>Description:</b> Operational energy efforts seek to decrease overall mission energy intensity (i.e. energy demand reduction). Efforts in this program can include prototyping and demonstration of technologies and processes that maximize combat capability by optimizing the following areas: platform energy use, mission planning and execution, propulsion sustainment, and energy logistics. Energy education, energy-informed wargaming, digital engineering, and modeling and simulation efforts typically support these efforts. Specific examples of prototype					

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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</i>
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**C. Accomplishments/Planned Programs (\$ in Millions)**

and demonstration projects that optimize energy use and decrease energy intensity include: legacy aircraft drag reduction technologies, alternate-fuel propulsion systems, ultra-efficient airframe designs, air-asset allocation tools, cargo load planning tools, and turbine engine sustainment enhancements for increased fuel efficiency.

While similar efforts may be found in other program elements, Operational Energy projects in these technology and process areas are viewed through an "energy lens," specifically geared toward cost-effectively optimizing energy use to maximize combat capability. Ideally, as the Air Force progresses toward an energy-aware culture, all acquisition efforts will incorporate this tenet from the beginning of, and throughout, the acquisition life cycle. This program aims to advance such a culture through successful project execution.

***FY 2022 Plans:***

Continue legacy aircraft drag reduction efforts for cargo and tanker aircraft. Projects include C-17 aft body drag reduction, C-130 aft body drag reduction, and KC-135 drag reduction and will involve prototyping, demonstration, and fuel savings validation. Also continue development and implementation of mission planning and execution software tools and processes. Projects include cargo optimization (e.g. improved load planning), mobility asset allocation optimization, and mission scheduling optimization.

***FY 2023 Base Plans:***

(Also listed under the Tech Transition Program (0604858F) where FY 2023 funds are currently located): Operational energy software development, test, and deployment includes feature improvement operational tools, enabling of data analytics for decision advantage, and prototyping of new applications to improve mission effectiveness and energy intensity of operations. Operational energy efforts support technology development that aims to optimize Mobility Air Forces allocation and long range planning, unit readiness, and tactical and operational cargo planning processes. Operational energy efforts allow modeling and simulation to help DOD members understand the energy effects of decisions and the impacts on the total force, enabling better decision making and a more proactive energy posture. Operational Energy legacy aircraft drag reduction prototyping and demonstration efforts seek to improve the aerodynamic efficiency of legacy aircraft including the C-17, C-130, and KC-135.

***FY 2023 OCO Plans:***

N/A

***FY 2022 to FY 2023 Increase/Decrease Statement:***

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>and demonstration projects that optimize energy use and decrease energy intensity include: legacy aircraft drag reduction technologies, alternate-fuel propulsion systems, ultra-efficient airframe designs, air-asset allocation tools, cargo load planning tools, and turbine engine sustainment enhancements for increased fuel efficiency.</p> <p>While similar efforts may be found in other program elements, Operational Energy projects in these technology and process areas are viewed through an "energy lens," specifically geared toward cost-effectively optimizing energy use to maximize combat capability. Ideally, as the Air Force progresses toward an energy-aware culture, all acquisition efforts will incorporate this tenet from the beginning of, and throughout, the acquisition life cycle. This program aims to advance such a culture through successful project execution.</p> <p><b><i>FY 2022 Plans:</i></b></p> <p>Continue legacy aircraft drag reduction efforts for cargo and tanker aircraft. Projects include C-17 aft body drag reduction, C-130 aft body drag reduction, and KC-135 drag reduction and will involve prototyping, demonstration, and fuel savings validation. Also continue development and implementation of mission planning and execution software tools and processes. Projects include cargo optimization (e.g. improved load planning), mobility asset allocation optimization, and mission scheduling optimization.</p> <p><b><i>FY 2023 Base Plans:</i></b></p> <p>(Also listed under the Tech Transition Program (0604858F) where FY 2023 funds are currently located): Operational energy software development, test, and deployment includes feature improvement operational tools, enabling of data analytics for decision advantage, and prototyping of new applications to improve mission effectiveness and energy intensity of operations. Operational energy efforts support technology development that aims to optimize Mobility Air Forces allocation and long range planning, unit readiness, and tactical and operational cargo planning processes. Operational energy efforts allow modeling and simulation to help DOD members understand the energy effects of decisions and the impacts on the total force, enabling better decision making and a more proactive energy posture. Operational Energy legacy aircraft drag reduction prototyping and demonstration efforts seek to improve the aerodynamic efficiency of legacy aircraft including the C-17, C-130, and KC-135.</p> <p><b><i>FY 2023 OCO Plans:</i></b></p> <p>N/A</p> <p><b><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i></b></p>					

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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</i>
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<b>C. Accomplishments/Planned Programs (\$ 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>
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See note under overall program element cost table.

<b>Title:</b> Installation Resilience	-	0.000	0.000	0.000	0.000
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**Description:** Installation Resilience efforts seek to ensure Air Force installations provide the energy necessary to execute their mission. Insufficient installation energy at critical times most often results in mission failure. Given the oft-unique nature of each installation, these efforts typically require a complex balance of cost-effective yet assured installation energy. While energy cost and environmental factors are primary considerations, effectively mitigating the risk of disrupted energy supplies to Air Force installations is also a critical function.

Installation Resilience prototype and demonstration projects seek to optimize the balance of cost-effectiveness and mission assurance, while considering environmental factors. Both technology and process innovations are leveraged to achieve these goals. Project examples include energy-as-a-service and charging-as-a-service business process demonstrations, microgrid technology prototypes and demonstrations, and geothermal technology demonstrations.

**FY 2022 Plans:**  
FY 2022 efforts (via congressional add funding) are still in the planning stages and will be coordinated with congressional staff members shortly after submission of this budget document.

**FY 2023 Base Plans:**  
To be determined.

**FY 2023 OCO Plans:**  
N/A

**FY 2022 to FY 2023 Increase/Decrease Statement:**  
N/A

<b>Accomplishments/Planned Programs Subtotals</b>	-	34.000	0.000	0.000	0.000
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	<b>FY 2021</b>	<b>FY 2022</b>			
<b>Congressional Add:</b> Program Increase - Energy and Climate Resilience	0.000	70.000			

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	<b>FY 2021</b>	<b>FY 2022</b>
<b>FY 2021 Accomplishments:</b> n/a		
<b>FY 2022 Plans:</b> Conduct Congressionally Directed Efforts		
<b>Congressional Adds Subtotals</b>	0.000	70.000

**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>
• RDTE 04 0604858F: <i>Tech Transition Program</i>	0.000	-	58.000	-	58.000	8.000	8.000	8.000	1.000	Continuing	Continuing

**Remarks**

Operational Energy and Installation Resilience efforts were previously funded under the Tech Transition Program (0604858F), primarily through congressional adds (e.g. Alternative Energy). A new program element dedicated to these areas was congressionally directed in the FY 2022 Appropriations Bill.

**E. Acquisition Strategy**

The efforts within this program element are variable and will employ multiple different acquisition strategies. In general, projects will seek to inform senior decision makers regarding the suitability of technology and process transition. As an example, for legacy aircraft drag reduction technologies, solutions will be prototyped and demonstrated via ground and/or flight assessments; drag reduction and fuel savings estimates will be validated or refined, suitability for fleet implementation will be assessed (maintainability, return-on-investment, etc.), and recommendations for transition will be made. Both FAR-based contracts and Other Transactions will be utilized.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</i>	<b>Project (Number/Name)</b> 644860 / <i>Operational Energy and Installation Resilience</i>
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<b>Product Development (\$ in Millions)</b>				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			
C-17 Aft Body Drag Reduction	TBD	Various : Various	-	-		2.900	Jul 2022	-		-		-	Continuing	Continuing	-
C-17 Drag Reduction - Other	TBD	Various : Various	-	-		1.400	Jul 2022	-		-		-	Continuing	Continuing	-
C-130 Aft Body Drag Reduction	TBD	Various : Various	-	-		2.900	Jul 2022	-		-		-	Continuing	Continuing	-
KC-135 Aft Body Drag Reduction	TBD	Various : Various	-	-		3.700	Jul 2022	-		-		-	Continuing	Continuing	-
KC-135 Vertical Windshield Wipers	TBD	Various : Various	-	-		1.800	Jun 2022	-		-		-	Continuing	Continuing	-
Mobility Aircraft Control Surface Analysis	TBD	Various : Various	-	-		1.800	Jul 2022	-		-		-	Continuing	Continuing	-
Cargo Optimization - Improved Load Planning	TBD	Various : Various	-	-		5.900	Jul 2022	-		-		-	Continuing	Continuing	-
Mobility Air Force Long Range Planning and Allocation Tools	Various	Various : Various	-	-		5.900	Jul 2022	-		-		-	Continuing	Continuing	-
Puckboard Scheduling Engine	TBD	Various : Various	-	-		5.900	Jul 2022	-		-		-	Continuing	Continuing	-
Program Increase - Energy & Climate Resilience	Various	Various : Various	-	-		67.000	Aug 2022	-		-		-	Continuing	Continuing	-
<b>Subtotal</b>			-	-		99.200		-		-		-	Continuing	Continuing	N/A

<b>Management Services (\$ in Millions)</b>				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			
Operational Energy, Installation Resilience, and Climate Resilience Program Management Administration Costs	Various	Various : Various	-	-		1.800	Jun 2022	-		-		-	Continuing	Continuing	-



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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2023 Air Force</b>			<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</i>	<b>Project (Number/Name)</b> 644860 / <i>Operational Energy and Installation Resilience</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

<b>Operational Energy</b>	
All	██████████
<b>Program Increase -Energy and Climate Resilience</b>	
All	██████████

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2023 Air Force		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604860F / <i>Operational Energy and Installation Resilience</i>	<b>Project (Number/Name)</b> 644860 / <i>Operational Energy and Installation Resilience</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>Operational Energy</i></b>				
All	2	2022	4	2022
<b><i>Program Increase -Energy and Climate Resilience</i></b>				
All	3	2022	4	2022