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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2022 Air Force **Date:** May 2021

<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 0604004F / <i>Advanced Engine Development</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	647.850	665.280	123.712	0.000	123.712	-	-	-	-	-	-
643608: <i>Advanced Engine Dev</i>	-	647.850	665.280	123.712	0.000	123.712	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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

The Advanced Engine Development Program enables demonstration of advanced turbine engine prototypes. This program is maturing fuel efficient adaptive engine component technologies and reducing associated risk in preparation for next-generation propulsion system development for combat aircraft applications. Adaptive engine technology enables next generation combat aircraft capabilities by combining the efficiency of high bypass turbofans used by commercial airlines with the performance demanded of military fighter engines. This technology has undergone initial development under the auspices of the Air Force Research Laboratory through the Adaptive Versatile Engine Technology (ADVENT) and Adaptive Engine Technology Demonstrator (AETD) programs.

This program element may include necessary emergent or unanticipated civilian pay expenses required to manage, execute, and deliver Advanced Engine Development for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY20 \$2.578M expended and in FY21 \$3.141M is estimated 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.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>
Previous President's Budget	671.442	636.495	111.830	0.000	111.830
Current President's Budget	647.850	665.280	123.712	0.000	123.712
Total Adjustments	-23.592	28.785	11.882	0.000	11.882
• Congressional General Reductions	0.000	-1.215			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	30.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-23.592	0.000			
• Other Adjustments	0.000	0.000	11.882	0.000	11.882

**Change Summary Explanation**

FY 2020 SBIR/STTR Transfer

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FY 2021 Congressional Add for Program Increase FY 2021 Congressional General Reductions				
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p><b>Title:</b> Adaptive Engine Transition Program</p> <p><b>Description:</b> The Adaptive Engine Transition Program (AETP) will design and manufacture multiple flight-weight adaptive engine prototypes, complete component rig assessments, characterize materials, and inform manufacturing process improvements. The program will demonstrate adaptive engine technology can be scaled to meet military fighter engine size requirements, while ensuring appropriate manufacturing and technology readiness levels by producing flight-weight prototypes. The prototype engines will demonstrate fuel efficiency increases, thrust increases, and new component technologies by performing sea-level, altitude, and durability assessments across multiple power settings. These assessments will provide data to quantify the capability and reduce risk in areas such as thermal capacity, reliability, and supportability, among others.</p> <p>The FY 2022 Budget Justification Exhibit includes a breakout of the FY 2020 through FY 2022 Next Generation Adaptive Propulsion (NGAP) funds from the AETP effort to increase transparency to Congress.</p> <p><b>FY 2021 Plans:</b> Complete component rig activities. Complete technology, affordability, and sustainability studies. Complete prototype engine fabrication and conduct engine assessments. Continue airframe integration/adaptive propulsion design efforts. More details can be provided in an appropriate forum.</p> <p><b>FY 2022 Plans:</b> Funds prototype engine assessments and airframe integration/adaptive propulsion design efforts.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> FY 2022 decreased compared to FY 2021 by 200.755 million. Decrease in funding reflective of engine assessments being the last phase of the prototyping effort.</p>		526.956	214.291	13.536
<p><b>Title:</b> Next Generation Adaptive Propulsion</p> <p><b>Description:</b> The Next Generation Adaptive Propulsion (NGAP) effort will design and perform component risk reduction for flight-weight adaptive engine prototypes for Next Generation Air Dominance (NGAD) capabilities. NGAP will demonstrate that adaptive engine technology can be scaled to meet Next Generation Air Dominance (NGAD) engine size requirements while ensuring appropriate manufacturing and technology readiness levels.</p> <p>The FY 2022 Budget Justification Exhibit includes a breakout of the FY 2020 through FY 2022 Next Generation Adaptive Propulsion (NGAP) funds from the AETP effort to increase transparency to Congress.</p>		120.894	450.989	110.176

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p><b>FY 2021 Plans:</b> Complete adaptive engine initial design activities and initiate preliminary design activities for Next Generation Air Dominance (NGAD) capabilities. More details can be provided in an appropriate forum.</p> <p><b>FY 2022 Plans:</b> Continue adaptive engine preliminary design activities, and initiate prototyping activities for Next Generation Air Dominance (NGAD) capabilities. More details can be provided in an appropriate forum.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> FY 2022 decreased compared to FY 2021 by 340.813 million. Funding decreased to a single vendor strategy for NGAP prototyping. More details can be provided in an appropriate forum.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		647.850	665.280	123.712
<b>D. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>E. Acquisition Strategy</b>				
<p>For the Adaptive Engine Transition Program, the Air Force awarded two limited source, cost plus incentive fee contracts back in 2016 to General Electric and Pratt &amp; Whitney due to their unique qualifications to design a high performance, flight-weight adaptive turbine engine in the thrust class for AETP. Incentive categories include engine weight, performance factors, and maintainability and supportability, with specific metrics for each category incentivized. Embedded in each AETP contract was an option for the Next Generation Adaptive Propulsion (NGAP) effort. In 2018, these options were exercised and awarded to optimize risk reduction for Next Generation Air Dominance (NGAD) capabilities through the NGAP effort. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Propulsion Directorate, Wright-Patterson Air Force Base, Ohio.</p>				

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604004F / <i>Advanced Engine Development</i>	<b>Project (Number/Name)</b> 643608 / <i>Advanced Engine Development</i>
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<b>Product Development (\$ in Millions)</b>				<b>FY 2020</b>		<b>FY 2021</b>		<b>FY 2022 Base</b>		<b>FY 2022 OCO</b>		<b>FY 2022 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Adaptive Engine Transition Program - GE	C/CPIF	GE : Evendale, OH	-	234.946	Oct 2019	89.574	Oct 2020	5.811		-		5.811	-	-	-
Adaptive Engine Transition Program - PW	C/CPIF	PW : East Hartford, CT	-	287.858	Oct 2019	121.970	Oct 2020	5.811		-		5.811	-	-	-
Next Generation Adaptive Propulsion (Preliminary Design) - GE	C/CPIF	GE : Evendale, OH	-	56.896	Oct 2019	220.494	Oct 2020	-		-		-	-	-	-
Next Generation Adaptive Propulsion (Preliminary Design) - PW	C/CPIF	PW : East Hartford, CT	-	60.268	Oct 2019	224.607	Oct 2020	-		-		-	-	-	-
Next Generation Adaptive Propulsion (Detailed Design & Prototyping) - TBD	C/TBD	TBD : TBD	-	-		-		108.262	Apr 2022	-		108.262	-	-	-
<b>Subtotal</b>			-	639.968		656.645		119.884		-		119.884	-	-	N/A

<b>Management Services (\$ in Millions)</b>				<b>FY 2020</b>		<b>FY 2021</b>		<b>FY 2022 Base</b>		<b>FY 2022 OCO</b>		<b>FY 2022 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Adaptive Engine Transition Program - Program Management Support	Various	Various : TBD	-	5.441	Dec 2019	4.317	Dec 2020	1.914	Dec 2021	-		1.914	-	-	-
Next Generation Adaptive Propulsion - Program Management Support	Various	Various : TBD	-	2.441	Dec 2019	4.318	Dec 2020	1.914	Dec 2021	-		1.914	-	-	-
<b>Subtotal</b>			-	7.882		8.635		3.828		-		3.828	-	-	N/A

<b>Project Cost Totals</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>	-	647.850	665.280	123.712	-	123.712	-	-	N/A

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	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>	

**Remarks**  
 The FY 2022 Budget Justification Exhibit includes a breakout of the FY 2020 through FY 2022 Next Generation Adaptive Propulsion (NGAP) funds from the AETP effort to increase transparency to Congress.



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2022 Air Force		<b>Date:</b> May 2021
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>Adaptive Engine Transition Program</i></b>				
Detailed Design, Engine Fabrication, Engine Assessments	1	2020	4	2022
<b><i>Next Generation Adaptive Propulsion</i></b>				
Initial Design, Preliminary Design	1	2020	2	2023
Adaptive Prototyping Plan, Detailed Design, Engine Fabrication, Engine Assessments	3	2022	4	2026

**Note**

The FY 2022 Budget Justification Exhibit includes a breakout of the FY 2020 through FY 2022 Next Generation Adaptive Propulsion (NGAP) funds from the AETP effort to increase transparency to Congress.

The Adaptive Engine Transition Program consists of three phases: detailed design, engine fabrication, and engine assessments.

Program deliverables include: military adaptive engine detailed design parameters and models; multiple engine sets of hardware (plus spare parts); matured technologies; major rig assessment data (controls, combustor, etc.); program reviews; and technology, affordability and sustainability studies.

The Next Generation Adaptive Propulsion effort consists of six phases initial design, preliminary design, adaptive prototyping planning, detailed design, engine fabrication, and engine assessments that will continue into 2027.

Program deliverables include: military adaptive engine detailed design parameters and models; engine hardware (plus spare parts); matured technologies; major rig assessment data (controls, combustor, etc.); program reviews; and technology, affordability and sustainability studies for Next Generation Air Dominance (NGAD) capabilities.

Additional details can be provided in the appropriate forum.