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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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 0604004F / <i>Advanced Engine Development</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	720.355	878.442	0.000	878.442	637.657	0.000	0.000	0.000	0.000	2,236.454
643608: <i>Advanced Engine Dev</i>	-	0.000	720.355	878.442	0.000	878.442	637.657	0.000	0.000	0.000	0.000	2,236.454
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 multiple 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 Engine Technology and Adaptive Engine Technology Demonstrator programs.

The Advanced Engine Development program element is new for FY 2019. In FY 2019, the entirety of this program was transferred from PE 0604858F, Tech Transition Program, to PE 0604004F, Advanced Engine Development, Project 643608, Advanced Engine Dev, in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Defense Appropriations Act 2019. This is an administrative realignment only and is not a new start.

In addition, this program element may include necessary civilian pay expenses required to manage, execute, and deliver advanced engine capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	720.355	878.442	0.000	878.442
Total Adjustments	0.000	720.355	878.442	0.000	878.442
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-70.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	790.355			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	878.442	0.000	878.442

Change Summary Explanation

Increase in FY 2019 of \$790.355 million is due to a Congressional directed transfer in the Department of Defense Appropriations Act 2019 to move Advanced Engine Development work (Adaptive Engine Transition Program) from PE 0604858F, Tech Transition, to its own program element (PE 0604004F).

Decrease in FY 2019 of \$70.000 million is due to a Congressional directed reduction in the Department of Defense Appropriations Act 2019 for unjustified growth.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: Adaptive Engine Transition Program	0.000	720.355	878.442
Description: 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. By producing flight-weight prototypes, 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 performing sea-level, altitude, and durability assessments across multiple power settings, the prototype engines will demonstrate fuel efficiency increases, thrust increases, and new component technologies. These assessments will provide data to quantify the capability and reduce risk in areas such as thermal capacity, reliability, and supportability, among others.			
In FY 2018, this work was performed under PE 0604858F, Tech Transition Program, Project 645351, Prototyping, Adaptive Engine Transition Program effort.			
FY 2019 Plans:			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Continue detailed design activities. Continue component rig activities. Continue technology, affordability, and sustainability studies. Begin first engine fabrication. Begin additional airframe integration/adaptive propulsion design efforts. More details can be provided in an appropriate forum.			
<i>FY 2020 Plans:</i> Continue component rig activities. Continue technology, affordability, and sustainability studies. Continue engine fabrication. Begin engine assessments. Continue additional airframe integration/adaptive propulsion design efforts. More details can be provided in an appropriate forum.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$158.087 million. Funding increased due to continued emphasis on additional capability maturation and risk reduction efforts for multiple adaptive propulsion applications. More details can be provided in an appropriate forum.			
Accomplishments/Planned Programs Subtotals	0.000	720.355	878.442

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	
• RDTE 04 0604858F: <i>Tech Transition Program</i>	565.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	565.450

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

E. Acquisition Strategy
For Adaptive Engine Transition Program, the Air Force has awarded two limited source, cost plus incentive fee contracts to General Electric and Pratt & 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 area incentivized. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Propulsion Directorate, Wright-Patterson Air Force Base, Ohio.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i>	Project (Number/Name) 643608 / <i>Advanced Engine Dev</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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			
Adaptive Engine Transition Program - GE	C/CPIF	GE : Evendale, OH	-	0.000		361.453	Oct 2018	436.017	Oct 2019	-		436.017	Continuing	Continuing	-
Adaptive Engine Transition Program - PW	C/CPIF	PW : East Hartford, CT	-	0.000		355.002	Oct 2018	433.502	Oct 2019	-		433.502	Continuing	Continuing	-
Subtotal			-	0.000		716.455		869.519		-		869.519	Continuing	Continuing	N/A

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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			
Adaptive Engine Transition Program - Program Management Support	Various	Various : TBD	-	0.000		3.900	Dec 2018	8.923	Dec 2019	-		8.923	Continuing	Continuing	-
Subtotal			-	0.000		3.900		8.923		-		8.923	Continuing	Continuing	N/A

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.000	720.355	878.442	-	878.442	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i>	Project (Number/Name) 643608 / <i>Advanced Engine Dev</i>

FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
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>Adaptive Engine Transition Program</i>	
Detailed Design, Engine Fabrication, Engine Assessments	

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i>	Project (Number/Name) 643608 / <i>Advanced Engine Dev</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Adaptive Engine Transition Program</i>				
Detailed Design, Engine Fabrication, Engine Assessments	1	2019	2	2022

Note

In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

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 scheduled has been extended to accommodate additional airframe integration and adaptive propulsion work that was awarded in FY 2018.

Additional details can be provided in the appropriate forum.