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

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>					<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>							
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	-	62.187	130.916	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
635280: <i>Manufacturing Technologies</i>	-	62.187	130.916	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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

This program executes technical programs to maintain and develop an affordable and reliable industrial base and manufacturing capability that will be responsive to warfighter needs. The program develops and improves manufacturing technologies and processes to enable cost reduction, improve component and system quality, and enhance industrial capability. Value stream modifications and manufacturing throughput improvements are effected to shorten cycle times of weapon systems during design, development, production and sustainment. Manufacturing Technologies objectives are conducted through industrial partnerships which enable the demonstration of manufacturing technologies for existing weapon system upgrades and/or for new warfighter systems. Efforts in the program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

In the FY 2021, the Air Force is consolidating its existing thirteen Advanced Technology Development (ATD), Research Development Test and Evaluation (RDT&E), Budget Activity 03 (BA 03) PEs into five new capability focused RDT&E BA 03 PEs to better align with the Air Force Science and Technology (S&T) Strategy signed by the SECAF in April 2019. This consolidation will improve and accelerate delivery of integrated transformational, multidisciplinary, collaborative technology solutions necessary to enable new Air Force warfighting capabilities that support of the National Defense Strategy. This new structure will provide the Air Force and Congress with a clearer understanding and increased transparency of integrated technology solutions and demonstrations key to enabling the Air Force future force design.

In FY 2021, the entirety of PE 0603680F, Manufacturing Technology Program and associated Project will be transferred to PE 0603030F, AF Foundational Development/Demonstration, as part of the Air Force RDT&E BA 03 PE consolidation in order to realign technology areas to better support the National Defense Strategy, Air Force Future Operating Concept, and Air Force S&T Strategy, April 2019. The Project and associated efforts will continue to be executed by the Air Force Research Laboratory Materials and Manufacturing Technology Directorate located in Wright Patterson AFB, Ohio. This is an administrative realignment for consolidation, and not a new start.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Previous President's Budget	65.760	43.116	44.416	0.000	44.416
Current President's Budget	62.187	130.916	0.000	0.000	0.000
Total Adjustments	-3.573	87.800	-44.416	0.000	-44.416
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	87.800			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.782	0.000			
• Other Adjustments	-1.791	0.000	-44.416	0.000	-44.416

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

**Project:** 635280: *Manufacturing Technologies*

- Congressional Add: *Program increase - F-35 Battery Technology*
- Congressional Add: *Program increase - Thermal protection for hypersonic vehicles*
- Congressional Add: *Program increase - Materials Development Research*
- Congressional Add: *Program Increase - Modeling Technology for Small Turbine Engines*
- Congressional Add: *Program increase - Low cost manufacturing methods for hypersonic vehicle components*
- Congressional Add: *Program increase - Flexible hybrid electronics*
- Congressional Add: *Program increase - Aerospace composite structures*
- Congressional Add: *Program increase - Certification of bonded aircraft structures*
- Congressional Add: *Program increase - Industrialization of ceramic matrix composites for hypersonic weapons*
- Congressional Add: *Program increase - Thermal batteries*
- Congressional Add: *Program increase - Technologies to repair fastener holes*
- Congressional Add: *Program increase - Manufacturing technology for reverse engineering*
- Congressional Add: *Program increase - Solid state battery research*
- Congressional Add: *Program increase - Agile manufacturing initiatives*

	<b>FY 2019</b>	<b>FY 2020</b>
	9.535	9.800
	0.000	10.000
	9.729	5.000
	3.892	5.000
	0.000	8.000
	0.000	5.000
	0.000	5.000
	0.000	5.000
	0.000	10.000
	0.000	2.000
	0.000	5.000
	0.000	5.000
	0.000	3.000
	0.000	10.000
Congressional Add Subtotals for Project: 635280	23.156	87.800

Congressional Add Subtotals for Project: 635280

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<b>Congressional Add Details (\$ in Millions, and Includes General Reductions)</b>		<b>FY 2019</b>	<b>FY 2020</b>
Congressional Add Totals for all Projects		23.156	87.800
<b>Change Summary Explanation</b>			
Decrease in FY 2019 in Other Adjustments of \$1.791 million is due to realignment of funds to PE 0602212F to support Research and Development Projects, 10 U.S.C. Section 2363, an amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B).			
Decrease in FY 2021 of \$44.416 million is due to the entirety of PE 0603680F, Manufacturing Technology Program, and associated Project being transferred to PE 0603030F, AF Foundational Development/Demos, as part of the Air Force RDT&E BA 03 PE consolidation to realign technology areas to better support the National Defense Strategy, Air Force Future Operating Concept, and the Air Force S&T Strategy, April 2019.			
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2019</b>	<b>FY 2020</b>
<b>Title:</b> Sustainment Manufacturing Technologies		10.929	12.072
<b>Description:</b> Develop and transition pervasive affordability and producibility technologies for the sustainment of weapons systems and processes.			
<b>FY 2020 Plans:</b> Advance high demand specialized manufacturing technologies to develop cost effective conventional production and special material repair technologies to enable affordable sustainment of aircraft systems. Align distributed advanced manufacturing techniques and concepts for agile sustainment and automation technology development for depot maintenance and flight line repair efficiency.			
<b>FY 2021 Plans:</b> In FY 2021, this work is performed under the Sustainment Manufacturing Technologies effort in PE 0603030F, AF Foundational Development/Demos, Project 635280, Manufacturing Technologies.			
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> FY 2021 decreased compared to FY 2020 by \$12.072 million. Funding decreased due to the transfer and realignment of this work to the Sustainment Manufacturing Technologies effort in PE 0603030F, AF Foundational Development/Demos, Project 635280, Manufacturing Technologies.			
<b>Title:</b> Advanced Manufacturing Technologies		28.102	31.044
<b>Description:</b> Develop and transition affordable advanced manufacturing technologies for weapons systems.			
<b>FY 2020 Plans:</b>			

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p>Continue to refine the development and demonstrate advanced agile manufacturing and repair capabilities for more affordable and increased availability of advanced turbine engine propulsion technologies, intelligence surveillance and reconnaissance and communications technologies, transparent ceramics producibility, and the producibility of air armaments. Continue and refine development of high demand distributed agile manufacturing applications and structures affordability with a focus on low cost attritable aircrafts with a focus on open architecture. Transition successful technologies. Continue the development and demonstrate manufacturing capabilities for producibility and affordability of aerospace structures, and hypersonics.</p> <p><b>FY 2021 Plans:</b> In FY 2021, this work is performed under the Advanced Manufacturing Technologies effort in PE 0603030F, AF Foundational Development/Demos, Project 635280, Manufacturing Technologies.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> FY 2021 decreased compared to FY 2020 by \$31.044 million. Funding decreased due to the transfer and realignment of this work to the Advanced Manufacturing Technologies effort in PE 0603030F, AF Foundational Development/Demos, Project 635280, Manufacturing Technologies.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	39.031	43.116	0.000

	<b>FY 2019</b>	<b>FY 2020</b>
<b>Congressional Add:</b> Program increase - F-35 Battery Technology	9.535	9.800
<b>FY 2019 Accomplishments:</b> Conducted Congressionally directed efforts.		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Add:</b> Program increase - Thermal protection for hypersonic vehicles	0.000	10.000
<b>FY 2019 Accomplishments:</b> Not Applicable		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Add:</b> Program increase - Materials Development Research	9.729	5.000
<b>FY 2019 Accomplishments:</b> Conducted Congressionally directed efforts.		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Add:</b> Program Increase - Modeling Technology for Small Turbine Engines	3.892	5.000

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3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	PE 0603680F I Manufacturing Technology Program		
	<b>FY 2019</b>	<b>FY 2020</b>	
<b>FY 2019 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Low cost manufacturing methods for hypersonic vehicle components	0.000	8.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Flexible hybrid electronics	0.000	5.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Aerospace composite structures	0.000	5.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Certification of bonded aircraft structures	0.000	5.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Industrialization of ceramic matrix composites for hypersonic weapons	0.000	10.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Thermal batteries	0.000	2.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Technologies to repair fastener holes	0.000	5.000	
<b>FY 2019 Accomplishments:</b> Not Applicable			
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.			
<b>Congressional Add:</b> Program increase - Manufacturing technology for reverse engineering	0.000	5.000	

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	FY 2019	FY 2020
<b>FY 2019 Accomplishments:</b> Not Applicable		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Add:</b> Program increase - Solid state battery research	0.000	3.000
<b>FY 2019 Accomplishments:</b> Not Applicable		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Add:</b> Program increase - Agile manufacturing initiatives	0.000	10.000
<b>FY 2019 Accomplishments:</b> Not Applicable		
<b>FY 2020 Plans:</b> Conduct Congressionally directed efforts.		
<b>Congressional Adds Subtotals</b>	23.156	87.800

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A