Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603605F / *Advanced Weapons Technology*							
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	-	42.322	43.368	37.404	0.000	37.404	30.971	32.217	42.641	43.566	Continuing	Continuing
633151: *High Power Solid State Laser Technology*	-	30.572	28.200	19.244	0.000	19.244	13.040	13.355	23.351	23.857	Continuing	Continuing
633152: *High Power Microwave Development and Integration*	-	11.750	15.168	18.160	0.000	18.160	17.931	18.862	19.290	19.709	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration, and detailed assessment of directed energy (DE) weapon technologies for potential application on Air Force platforms. These include high energy laser (HEL), high power microwaves (HPM), and other unconventional weapon generation and transmission technologies, which can support a wide range of Air Force applications. The program develops a corresponding susceptibility, vulnerability, and lethality database for directed energy weapons. This program also develops laser-enabled atmospheric-compensated optical imaging for space situational awareness (SSA). Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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, 1206601F, and 0602298F.

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 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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Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*			R-1 Program Element (Number/Name) PE 0603605F / *Advanced Weapons Technology*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	45.502	43.368	37.467	0.000	37.467
Current President's Budget	42.322	43.368	37.404	0.000	37.404
Total Adjustments	-3.180	0.000	-0.063	0.000	-0.063
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.515	0.000			
• Other Adjustments	-1.665	0.000	-0.063	0.000	-0.063

Change Summary Explanation

Decrease in FY 2018 in Other Adjustments is due to realignment of funds to PE 0602212F to support Research and Development Projects, 10 U.S.C. Section 2358.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603605F / *Advanced Weapons Technology*	Project (Number/Name) 633151 / *High Power Solid State Laser Technology*	

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
633151: *High Power Solid State Laser Technology*	-	30.572	28.200	19.244	0.000	19.244	13.040	13.355	23.351	23.857	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides for the development, integration, demonstration, and detailed technical assessment of high energy laser (HEL) devices, advanced imaging and beam control technologies needed for applications such as force protection, force application, precision engagement, and aircraft self-protection. Laser system concept assessments to include vulnerability assessments and target effect testing are performed. This project also exploits the synergy between high energy laser beam control and advanced optical imaging for space situational awareness (SSA).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: High Energy Laser/Beam Control	30.572	27.624	18.738	0.000	18.738
Description: Develop and demonstrate advanced beam control technologies, integrated laser systems, and aircraft self-protection laser technologies. Demonstrate beam control components integrated with high energy lasers (HEL) for Air Force utility. ***FY 2019 Plans:*** Integrate a low power laser system into a pod for Phase 1 aircraft self-protect demonstration. Begin integration of a medium power laser system into the pod for Phase 2 aircraft self-protect demonstration. Continue with integration of the laser control subsystem for directing the laser onto the target for aircraft self-protect demonstration. Continue development of the ground support and aircraft interface. ***FY 2020 Base Plans:*** Continue to demonstrate the integrated low power laser system in a pod for Phase 1 aircraft self-protect demonstration. Continue integration of a medium power laser system into the pod for Phase 2 aircraft self-protect demonstration. Complete integration of the laser control subsystem for directing the laser onto the target for aircraft self-protect demonstration. Complete development of ground support and aircraft interface. Complete first amplifier prototype for ultra-compact laser and transition into laser subsystem development. ***FY 2020 OCO Plans:*** Not Applicable ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603605F / *Advanced Weapons Technology*	**Project (Number/Name)** 633151 / *High Power Solid State Laser Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2020 decreased compared to FY 2019 by $8.886 million. Funding decreased due to re-scoping of the Laser Subsystem Development activity.					
Title: Optical Space Situational Awareness and Satellite Vulnerability ***Description:*** Mature development of laser-enabled, long-range, electro-optical technologies that enable 24/7 ground-based optical space situational awareness (SSA) delivering characterization results on tactical timelines. Develop and demonstrate technologies that accurately assess the vulnerability of blue satellite systems to lasers. Manage and operate research assets in support of development, demonstration, and integration of ground-based optical space situational awareness (SSA) technologies. ***FY 2019 Plans:*** Develop full-dark real-time high-spatial resolution optical imaging of near-earth space objects using laser illumination. Initiate system requirements for demonstrating real-time daylight imaging of near-earth objects using laser-enabled atmospheric compensation. ***FY 2020 Base Plans:*** Continue development of full-dark real-time high-spatial resolution optical imaging of near-earth space objects using laser illumination. Complete system requirements for demonstrating real-time daylight imaging of near-earth objects using laser-enabled atmospheric compensation. ***FY 2020 OCO Plans:*** Not Applicable ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased by $0.070 million compared to FY 2019. Justification of decrease in plans above.	0.000	0.576	0.506	0.000	0.506
Accomplishments/Planned Programs Subtotals	30.572	28.200	19.244	0.000	19.244

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603605F / *Advanced Weapons Technology*	**Project (Number/Name)** 633151 / *High Power Solid State Laser Technology*

E. 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.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603605F / *Advanced Weapons Technology*				Project (Number/Name) 633152 / *High Power Microwave Development and Integration*			
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**
633152: *High Power Microwave Development and Integration*	-	11.750	15.168	18.160	0.000	18.160	17.931	18.862	19.290	19.709	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates high power microwave (HPM) and other unconventional weapon generation and transmission technologies that support a wide range of Air Force missions such as air base defense or the damage/destruction of an adversary's electronic infrastructure. It also provides inputs to the susceptibility, vulnerability, and lethality databases used across the Department of Defense (DoD) to understand thresholds for scalable effects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: High Power Microwave Technologies	11.750	15.168	18.160	0.000	18.160
Description: Develop and evaluate high power microwave (HPM) and other unconventional weapon technologies for various platforms, including aerial, for applications such as counter-electronics. Develop and evaluate high power microwave technologies for non-kinetic and counter-electronic weapon applications. ***FY 2019 Plans:*** Develop a class of reusable, multi-pulse, multi-target counter-electronics payloads capable of being hosted in various advanced platforms. Characterize, model, test and evaluate current and projected blue directed energy threats on current red assets. Design and develop the high power microwave (HPM) payload for the joint flight demonstration with the Navy. Conduct environmental testing of the high power microwave (HPM) missiles. ***FY 2020 Base Plans:*** Test a class of reusable, multi-pulse, multi-target counter-electronics payloads capable of being hosted in various advanced platforms. Continue to characterize, model, test and evaluate current and projected blue directed energy threats on current red assets. Develop and test the high power microwave payload for the joint flight demonstration with the Navy. Design agile waveform high power sources. ***FY 2020 OCO Plans:*** Not Applicable ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased by $2.992 million compared to FY 2019. Funding increased due to additional Joint Navy-Air Force High Power Microwave demonstration activities.					
Accomplishments/Planned Programs Subtotals	11.750	15.168	18.160	0.000	18.160

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603605F / *Advanced Weapons Technology*	**Project (Number/Name)** 633152 / *High Power Microwave Development and Integration*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. 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.