Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force											Date: February 2018	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603601F / *Conventional Weapons Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	105.487	167.415	194.981	0.000	194.981	231.292	209.642	223.712	228.334	Continuing	Continuing
63670A: *Weapon Technology Development*	-	71.709	87.215	95.132	0.000	95.132	57.895	51.830	74.854	76.367	Continuing	Continuing
63670B: *Weapon Concept Development*	-	33.778	80.200	99.849	0.000	99.849	173.397	157.812	148.858	151.967	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops, integrates, and demonstrates advance ordnance and guidance technologies for air-launched conventional weapons. The effort focuses on conventional ordnance component technologies such as war-heads, fuzes, and explosives, as well as munition guidance component technologies such as navigation and control systems and seekers. Technologies to be developed, demonstrated, and integrated into system concepts will address blast, fragmentation, penetration, low collateral damage, variable depth/location fuzing, precise guidance, and high-performance and insensitive explosives. 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, 0602601F, 0602602F, 0602605F, 0602788F, 1206601F, 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.

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	102.009	167.415	197.001	0.000	197.001
Current President's Budget	105.487	167.415	194.981	0.000	194.981
Total Adjustments	3.478	0.000	-2.020	0.000	-2.020
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	5.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.596	0.000			
• SBIR/STTR Transfer	-2.118	0.000			
• Other Adjustments	0.000	0.000	-2.020	0.000	-2.020

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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 0603601F / *Conventional Weapons Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2017	FY 2018
Project: 63670A: *Weapon Technology Development*		
Congressional Add: *Program increase*	4.898	0.000
Congressional Add Subtotals for Project: 63670A	4.898	0.000
Congressional Add Totals for all Projects	4.898	0.000

Change Summary Explanation

Decrease in FY 2019 due to Department of Defense (DoD) deflation adjustment.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force			Date: February 2018
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603601F / *Conventional Weapons Technology*	Project (Number/Name) 63670A / *Weapon Technology Development*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
63670A: *Weapon Technology Development*	-	71.709	87.215	95.132	0.000	95.132	57.895	51.830	74.854	76.367	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, matures, assesses, and demonstrates advanced/innovative ordnance and guidance component and subsystem technologies for air-launched conventional weapons. The project focuses on maturation of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Ordnance Technologies	34.871	49.817	53.125
Description: Develop and demonstrate integrated ordnance technologies to improve conventional air-delivered munitions. Specific technical areas of focus include energetic materials, fuze technology, warhead sciences, and modeling and simulation tools.			
FY 2018 Plans: Continue to demonstrate distributed, embedded fuzing concepts for close-controlled strike, area attack, and penetration applications (layer counting at high speed), including assessing long-term safety, survivability, and functionality. Continue development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Continue to develop ordnance technologies/methodologies for high-speed impact and functional defeat. Continue research for distributed and multi-point fuzing concepts to reduce the logistics tail necessary for future and fielded munitions systems, as well as safe and arm functions. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for air-to-air weaponry. Continue to mature research on distributed, collaborative, cooperative effects munitions technologies.			
FY 2019 Plans: Continue to demonstrate distributed, embedded fuzing concepts for close-controlled strike, area attack, and penetration applications (layer counting at high speed), including assessing long-term safety, survivability, and functionality. Continue development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and high fidelity analysis tools into higher level engineering and fast-running models to enable the war-fighter to make more accurate weaponnering choices.			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603601F / *Conventional Weapons Technology*	**Project (Number/Name)** 63670A / *Weapon Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Continue to develop ordnance technologies/methodologies for high-speed impact and functional defeat. Continue research for distributed and multi-point fuzing concepts to reduce the logistics tail necessary for future and fielded munitions systems, as well as safe and arm functions. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for air-to-air weaponry, and improve lethality and survivability tools at the meso-scale and micro-scale. Continue to mature research on distributed, collaborative, cooperative effects munitions technologies. Initiate the development high fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Initiate the incorporation of better material models and develop further joint kinetic/directed energy common target models. Initiate the incorporation of models for progressive collapse, multiple point initiation, secondary debris and others. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $3.308 million. Justification for this increase is due to an increased emphasis in ordnance technologies.			
Title: Guidance Technologies	31.940	37.398	42.007
Description: Develop guidance technologies to improve the precision, controlled lethality, and flexibility of conventional, air-delivered munitions. Specific technical areas include precision navigation and terminal seekers. ***FY 2018 Plans:*** Continue to conduct hardware-in-the-loop and software-in-the-loop to characterize air-to-air and air-to-ground guidance and control technologies. Continue increased emphasis on integrated hardware-in-the-loop, software-in-the-loop, and other Modeling and Simulation technologies for the demonstration of open architecture and modular weapon munition concepts. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software defined Radio Frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Complete design of Modeling and Simulation capability and initiate approval processes to permit simultaneous multi-level security Modeling and Simulation activities. Complete Modeling and Simulation center design and security approval processes to enable simultaneous, multi-level security Modeling and Simulation activities. ***FY 2019 Plans:*** Complete hardware-in-the-loop and software-in-the-loop characterization air-to-air and air-to-ground guidance and control technologies. Continue integration of hardware-in-the-loop, software-in-the-loop, and other Modeling and Simulation technologies for the demonstration of open architecture, high-speed, cooperative, and modular weapon munition concepts. Initiate the development of advanced modular and service oriented weapon architectures. Initiate the design and development of seeker			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603601F / *Conventional Weapons Technology*	**Project (Number/Name)** 63670A / *Weapon Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
subsystem prototypes for platform self-defense. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software defined Radio Frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Continue to refine and complete fabrication of Modeling and Simulation center and initiate processes to enable simultaneous multi-level security Modeling and Simulation activities. Initiate launch to lethality analyses of in-house and Air Force weapon concepts. Initiate the design of hotter/faster Infrared panoramic projector for advanced seeker testing. Initiate the integration of higher fidelity constructive analysis tools with engagement and mission level Modeling and Simulation. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased as compared to FY 2018 by $4.609 million. Justification for this increase is due to an increased emphasis in guidance technologies.			
Accomplishments/Planned Programs Subtotals	66.811	87.215	95.132

	FY 2017	FY 2018
Congressional Add: Program increase ***FY 2017 Accomplishments:*** Conducted Congressionally-directed efforts. ***FY 2018 Plans:*** N/A	4.898	0.000
Congressional Adds Subtotals	4.898	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

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 2019 Air Force			Date: February 2018
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603601F / *Conventional Weapons Technology*	Project (Number/Name) 63670B / *Weapon Concept Development*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
63670B: *Weapon Concept Development*	-	33.778	80.200	99.849	0.000	99.849	173.397	157.812	148.858	151.967	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, refines, integrates, demonstrates, and assesses ordnance and guidance technologies to reduce risk for potential air-launched conventional weapons acquisitions. The project concentrates in two effort areas, Air-to-Air Concept Development and Air-to-Ground Concept Development. The project focuses on risk reduction of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Air-to-Air Concept Development	3.718	30.220	40.809
Description: Mature, integrate, and demonstrate air-to-air weapon components and systems (ordnance, guidance, and carriage and release technologies) to demonstrate war-fighter capability. ***FY 2018 Plans:*** Continue to demonstrate weapon integration concept for air target engagement. Continue planning and technology risk reduction for weapon concepts responsive to the 2030 time-frame threat environment (including air-to-air weapons for both offensive and defensive purposes). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to incorporate higher fidelity methodologies into systems-level analysis, including joint weapons effectiveness. Continue to test prototype propulsion systems to demonstrate attributes to meet next-generation air-to-air weapon requirements. Continue to conduct lethality studies to enable design of small form factor self-defense of an air platform. Continue to develop preliminary design of weapon concept for sixth generation platform. Continue to conduct wind-tunnel and limited flight experiments to characterize air-to-air maneuverability, range, and guidance and control for sixth generation weapon concept. Continue to conduct ground and arena tests of advanced weapons experimental-carriages for sixth generation weapon concept and prepare for flight worthiness testing. ***FY 2019 Plans:*** Continue to demonstrate weapon integration concept for air target engagement. Continue planning and technology risk reduction for weapon concepts responsive to the 2030 time-frame threat environment (including air-to-air weapons for both offensive and defensive purposes). Continue to test prototype propulsion systems to demonstrate attributes to meet next-generation air-to-air weapon requirements. Continue to conduct lethality studies to enable design of small form factor self-defense of an air platform. Continue to develop preliminary design of weapon concept for sixth generation platform. Continue to conduct wind-tunnel and limited flight experiments to characterize air-to-air maneuverability, range, and guidance and control for sixth generation weapon			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603601F / *Conventional Weapons Technology*	**Project (Number/Name)** 63670B / *Weapon Concept Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
concept. Continue to conduct ground and arena tests of advanced weapons experimental-carriages for sixth generation weapon concept and prepare for flight worthiness testing. Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to incorporate higher fidelity methodologies into systems level analysis including joint weapons effectiveness. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $10.589 million. Justification for this increase is due to an increased emphasis in air-to-air concept development efforts.			
Title: Air-to-Ground Concept Development	30.060	49.980	59.040
Description: Mature, integrate, and demonstrate air-to-ground weapon components and systems (ordnance, guidance, and carriage and release technologies) to demonstrate war-fighter capability. ***FY 2018 Plans:*** Continue to conduct relevant long-range strike weapon technology demonstrations to reduce risk for potential follow-on acquisition programs, and finalize system detailed design for flying hypersonic munition demonstrator. Continue the development of munition concepts to incorporate technologies for carriage and terminal impact at high speed. Continue planning and technology risk reduction including demonstration and initial flight testing for weapons concepts responsive to the 2030 time-frame threat environment (including hypersonic and cooperative/collaborative concepts). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to incorporate higher fidelity methodologies into systems-level analysis, including joint weapons effectiveness and to apply methodology to support future air dominance analysis. Continue to investigate concepts for cooperative control of small weapons to produce scalable effects to increase the capacity and capability of fifth generation aircraft. Continue to refine competitive contractor processes to develop flying experimental concepts of the subsonic, standoff, low-cost cruise missile capability. Continue to develop kinetic/non-kinetic payloads, networking, seeker, fuze, and defense countermeasures technology for hypersonic applications. ***FY 2019 Plans:*** Continue to conduct relevant long range strike weapon technology demonstrations to reduce risk for potential follow-on acquisition programs, and finalize system detailed design for flying hypersonic monition demonstrator flight. Continue the development of monition concepts to incorporate technologies for carriage and terminal impact at high speed. Continue to investigate concepts for cooperative control of small weapons to produce scalable effects to increase the capacity and capability of fifth generation aircraft. Continue planning and technology risk reduction including demonstration and initial flight testing for weapons concepts responsive to the 2030 time-frame threat environment (including hypersonic and cooperative/collaborative concepts). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to incorporate higher fidelity methodologies into systems level analysis including joint weapons effectiveness and to apply			

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Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603601F / *Conventional Weapons Technology*	**Project (Number/Name)** 63670B / *Weapon Concept Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
methodology to support future air dominance analysis. Continue to refine competitive contractor processes to develop flying experimental concepts of the subsonic, standoff, low cost cruise missile capability. Continue to develop kinetic/non-kinetic payloads, networking, seeker, fuze, and defense countermeasures technology for hypersonic applications. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $9.060 million. Justification for this increase is due to an increased emphasis in air-to-ground concept development efforts.			
Accomplishments/Planned Programs Subtotals	33.778	80.200	99.849

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

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.