Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602602F / *Conventional Munitions*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	70.039	81.521	87.387	-	87.387	97.399	105.100	105.023	105.419	Continuing	Continuing
622068: *Advanced Guidance Technology*	-	29.914	32.801	40.757	-	40.757	46.084	49.015	48.188	47.544	Continuing	Continuing
622502: *Ordnance Technology*	-	40.125	48.720	46.630	-	46.630	51.315	56.085	56.835	57.875	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This program investigates, develops, and establishes the technical feasibility and military utility of guidance and ordnance technologies for conventional air-launched munitions. Program supports core technical competencies of fuze technology; energetic materials; damage mechanisms; munitions aerodynamics, guidance, navigation, and control; terminal seeker sciences; and munition systems effects. Technologies to be developed include blast, fragmentation, penetrating and low-collateral damage warheads, hard target fuzing, precise terminal guidance, and high performance and insensitive explosives. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

B. Program Change Summary ($ in Millions)	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	77.175	81.521	84.722	-	84.722
Current President's Budget	70.039	81.521	87.387	-	87.387
Total Adjustments	-7.136	-	2.665	-	2.665
• Congressional General Reductions	-0.150	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.513	-			
• Other Adjustments	-6.473	-	2.665	-	2.665

Change Summary Explanation

Decrease in FY13 Other Adjustments was due to Sequestration.

Increase in FY15 due to increased emphasis on advanced positioning, navigation and timing technologies.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602602F / *Conventional Munitions*	Project (Number/Name) 622068 / *Advanced Guidance Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
622068: *Advanced Guidance Technology*	-	29.914	32.801	40.757	-	40.757	46.084	49.015	48.188	47.544	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project investigates, develops, and evaluates conventional munitions guidance technologies to establish technical feasibility and military utility of innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation. Project payoffs include adverse-weather, GPS-degraded and GPS-denied, networked, and autonomous precision munition guidance capability; increased number of kills per sortie; increased aerospace vehicle survivability; improved weapon reliability and affordability; and improved weapon survivability and effectiveness.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Seeker Technologies	3.200	6.800	9.000

Description: Develop seeker technologies for air-delivered munitions to provide high confidence target discrimination and classification, precise target location, and robust terminal tracking.

FY 2013 Accomplishments:

Developed technologies to simplify, increase the flexibility, and reduce the cost of passive and active electro-optical, infrared, and radar munition seekers, with focus on combat operations in adverse weather and in high-speed engagements. Increased emphasis on developing seeker technologies that provide enhanced mission capability for fifth-generation aircraft, specifically as it applies to success in denied or anti-access environments. Continued developing algorithms and processing technologies to acquire and track targets with and without an operator-in-the-loop. Developed bio-inspired seeker technologies to increase immunity to countermeasures, exploit multi-discriminant signatures, and reduce the size and cost of detectors

FY 2014 Plans:

Increase emphasis in developing technologies that simplify, increase the flexibility, and reduce the cost of passive and active electro-optical, infrared, and radar munition seekers, with focus on combat operations in adverse weather and in high-speed engagements. Continue to emphasize development of seeker technologies that provide enhanced mission capability for fifth-generation aircraft, specifically as it applies to success in denied or anti-access environments. Develop algorithms and processing technologies to acquire and track targets with and without an operator in the loop. Increase emphasis on revolutionary bio-inspired seeker technologies to increase immunity to countermeasures, to exploit multi-discriminant signatures, and to reduce the size and cost of detectors. Increase emphasis on high-resolution wide field of view (WFOV) sensors, particularly with bio-inspired and high rate processing characteristics.

FY 2015 Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602602F / *Conventional Munitions*	**Project (Number/Name)** 622068 / *Advanced Guidance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Develop technologies that simplify, increase the flexibility, and reduce the cost of passive and active electro-optical, infrared, and radar munition seekers, with focus on combat operations in adverse weather and in high-speed engagements. Continue to emphasize high-resolution WFOV sensors, particularly with bio-inspired and high rate processing characteristics to allow precise munition terminal guidance in degraded, contested environments.			
Title: Aerodynamics, Navigation and Control Technologies ***Description:*** Develop weapon aerodynamic, control, navigation, and networking technologies for air-delivered munitions to provide precise, agile flight, networked effects, and immunity to countermeasures. ***FY 2013 Accomplishments:*** Continued developing technologies that achieve precision navigation under GPS-degraded and GPS-denied conditions. Developed weapon navigation and control networking technologies to provide options for enhanced mission capability in denied or anti-access environments. These technologies facilitate agile and maneuverable weapons, foster autonomy, trust, and networking, and enable precise munition control and actuation, especially for boosted penetrating munitions or during high-speed engagements. Increased emphasis in trusted terminal guidance and targeting flexibility/autonomy after long ingress and high attrition. ***FY 2014 Plans:*** Further develop technologies that achieve precision navigation under GPS-degraded and GPS denied conditions. Develop weapon navigation and control networking technologies that provide enhanced mission capability in denied or anti-access environments, facilitate agile and maneuverable weapons, foster autonomy, trust, and networking, and enable precise munition control and actuation, especially for munitions during high-speed engagements. Investigate multi-functional, multi-strategy weapon swarms to defeat enemy defenses. ***FY 2015 Plans:*** Increase emphasis in developing technologies that achieve precision navigation under GPS-degraded and GPS-denied conditions. Develop weapon navigation and control networking technologies that provide enhanced mission capability in denied or anti-access environments, facilitate agile and maneuverable weapons, foster autonomy, trust, and networking, and enable precise munition control and actuation. Continue to investigate multi-functional, multi-strategy weapon swarms to defeat enemy defenses. Develop technologies for weapon-platform interfaces that enable flexible, reprogrammable load-outs and achieve hardware and software modularity.	18.114	19.000	24.000
Title: Guidance Technologies ***Description:*** Develop guidance subsystem integration and evaluation technologies to provide open and closed loop ground testing, flight test risk reduction, and digital simulation of novel concepts. ***FY 2013 Accomplishments:***	8.600	7.001	7.757

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602602F / *Conventional Munitions*	**Project (Number/Name)** 622068 / *Advanced Guidance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Investigated precision guided munition integration technology issues and functionality. Developed the capability to simulate, test, and refine pioneering seeker concepts and navigation and control approaches in a realistic operational environment. Increased development efforts for guidance integration and evaluation technologies that provide enhanced mission capability for fifth-generation aircraft. Continued pursuing multi-weapon search and attack technologies on a time critical moving target. Established test technologies for evaluating higher speed weapon guidance subsystems. ***FY 2014 Plans:*** Develop precision guided munition integration technology and functionality. Focus on capabilities to simulate, test, and refine seeker concepts and navigation and control approaches in a realistic operational environment. Continue emphasis on guidance integration and evaluation technologies that provide enhanced mission capability for fifth-generation aircraft. Develop modeling techniques and tools to evaluate integrated, multi-weapon, and swarming search and attack. Improve test technologies for evaluating higher speed weapon guidance subsystems. ***FY 2015 Plans:*** Continue to develop a modular radio-frequency hardware-in-the-loop capability to support munitions concepts with high speed target engagement. Continue developing new infrared projection capabilities to evaluate a new class of multi-aperture sensor systems. Continue to develop a real-time radar/millimeter wave signature generation capability for testing algorithms in real-time software and hardware in-the-loop environments.			
Accomplishments/Planned Programs Subtotals	29.914	32.801	40.757

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602602F / *Conventional Munitions*	Project (Number/Name) 622502 / *Ordnance Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
622502: *Ordnance Technology*	-	40.125	48.720	46.630	-	46.630	51.315	56.085	56.835	57.875	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project investigates, develops, and evaluates conventional ordnance technologies to establish technical feasibility and military utility for advanced explosives, fuzes, warheads, submunitions, and weapon airframes, carriage, and dispensing. The project also assesses the lethality and effectiveness of current and planned conventional weapons technology programs and assesses target vulnerability. The payoffs include improved storage capability and transportation safety of fully assembled weapons, improved warhead and fuze effectiveness, improved submunition dispensing, low-cost airframe/subsystem components and structures, and reduced aerospace vehicle and weapon drag.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Energetic Materials Technology	9.980	10.000	10.000
Description: Investigate and develop energetic materials technology that can maximize weapon lethality, while applying appropriate safety and security features. ***FY 2013 Accomplishments:*** Developed, modeled, and tested explosive fills that reduce pre-detonation during warhead penetration. Continued developing low density energetic materials for small munition applications. Demonstrated new nanoenergetic materials that enhance and tailor explosive effects. Developed energetic materials with improved properties to enable the increased capability and capacity of fifth-generation aircraft. ***FY 2014 Plans:*** Continue to develop, model, and test explosive fills that reduce pre-detonation during warhead penetration. Further develop low density energetic materials for small munition applications. Exploit new nanoenergetic materials to enhance and tailor explosive effects. Emphasize development of energetic materials that improve performance and reduce bomb and missile size to increase loadout. ***FY 2015 Plans:*** Continue to emphasize development of energetic materials, including reactive cases, that improve performance and reduce bomb and missile size so as to increase loadout and increase safety. Continue to investigate energetic formulations that increase thermal and vibration tolerance required for very long range, high speed munitions. Continue to develop a virtual design tool for use in material design activities.			
Title: Fuze Technologies	9.700	13.800	13.000

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602602F / *Conventional Munitions*	**Project (Number/Name)** 622502 / *Ordnance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Description: Investigate and develop fuzes for air-delivered weapon applications to develop novel energetic initiation concepts, penetration fuzing, point burst fuzes, and develop predictive models. ***FY 2013 Accomplishments:*** Expanded effort to investigate novel methods to initiate explosives, including new modeling and testing techniques. Increased emphasis on fuze technologies that enable increased capacity and capability of fifth-generation aircraft, specifically as it facilitates success in denied or anti-access environments. Continued to investigate and characterize the mechanical environment that a fuze must survive during hard target penetration events. Continued to explore ground profiling imaging fuze technology, and developed a hardened chip fuze that uses integrated logic. ***FY 2014 Plans:*** Improve modeling and testing techniques to investigate novel methods to initiate explosives, to include distributed and embedded fuzing concepts. Emphasize development of fuze technologies that enable increased capacity and capability of fifth-generation aircraft, specifically as it facilitates success in denied or anti-access environments. Continue to investigate and characterize the mechanical environment that a fuze must survive during hard target penetration, and explore ground profiling imaging fuze technology. ***FY 2015 Plans:*** Continue developing a fuzing system employing ground profiling radar for miniature ordnance packages to enable more lethal forward-firing as well as low collateral damage. Investigate the capability to predict and measure fuze performance during munition penetration at high impact speeds.			
Title: Warhead Technologies ***Description:*** Investigate and develop innovative warhead kill mechanisms, such as adaptable warheads, directional-control fragmenting warheads, and reactive metals. ***FY 2013 Accomplishments:*** Developed novel warhead technologies that enable small, agile munitions to provide the capability to deliver selectable effects on targets. Continued investigating directional warhead concepts to improve standoff kills for non-direct hit encounters by employing reactive fragments and by utilizing a forward focusing fragment capability. Continued developing tools to better predict material-to-material interface dynamics, loading, and vibration during high-speed penetration. ***FY 2014 Plans:*** Increase emphasis in developing warhead technologies, especially those that enable munition agility, variable effects, and improved energy coupling. Continue investigating directional warhead concepts to improve standoff kills for non-direct hit	11.792	13.900	13.000

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602602F / *Conventional Munitions*	**Project (Number/Name)** 622502 / *Ordnance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
encounters by employing reactive fragments or by utilizing a forward focusing fragment capability. Continue developing tools to better predict material-to-material interface dynamics, loading, and vibration during high-speed penetration. ***FY 2015 Plans:*** Develop penetrator technologies that address penetrator stability through novel nose shapes and increased survivability through internal structures for high-speed impacts into hard and deeply buried targets. Continue to develop small, multi-output warhead technologies primarily for soft surface targets, but with limited penetration capability for hardened, shallow structures.			
Title: Ordnance Technologies ***Description:*** Using a system approach, investigate and develop ordnance concepts by making technology trades between fuzes, warheads, and explosives and by improving weapon carriage, release, and dispensing. ***FY 2013 Accomplishments:*** Investigated precision guided munition integration issues and functionality in various flight environments. Built interoperable simulations to evaluate emerging technologies. Developed enhanced models with improvements for small munitions, penetrators, and counter chemical, biological, radiological, and nuclear effects. Increased emphasis on pioneering ordnance concepts that increase the capacity and capability of fifth-generation aircraft. ***FY 2014 Plans:*** Continue to investigate precision guided munition integration issues and functionality in various flight environments, and continue building and using interoperable simulations to evaluate emerging technologies. Continue developing technologies to improve models for small munitions, penetrators, and counter chemical, biological, radiological, and nuclear effects. Develop ordnance concepts that increase the capacity and capability of fifth-generation aircraft. ***FY 2015 Plans:*** Continue to develop mission-level simulation architecture capability to enable weapon system and weapon technology assessments. Continue development of multiphase physics models analyzing the detonation of a warhead and the dispersal of either a neutralizer or fuel. Continue to develop inventive ordnance concepts that increase the capacity and capability of fifth-generation aircraft.	8.653	11.020	10.630
Accomplishments/Planned Programs Subtotals	40.125	48.720	46.630

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602602F / *Conventional Munitions*	**Project (Number/Name)** 622502 / *Ordnance Technology*

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.