Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force										DATE: February 2012	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*							
COST ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	60.365	60.656	77.175	-	77.175	84.162	83.955	84.648	87.731	Continuing	Continuing
622068: *Advanced Guidance Technology*	19.555	20.820	32.955	-	32.955	34.081	34.227	35.884	35.565	Continuing	Continuing
622502: *Ordnance Technology*	40.810	39.836	44.220	-	44.220	50.081	49.728	48.764	52.166	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program investigates, develops, and establishes the technical feasibility and military utility of advanced guidance and ordnance technologies for conventional air-launched munitions. Program supports core technical competencies of fuze technology, energetic materials, damage mechanisms, munitions aerodynamics and guidance, navigation, and control, terminal seeker sciences, and munition systems effects. Technologies to be developed include blast, fragmentation, penetrating and low-collateral damage warheads, variable height/depth fuzing, precise terminal guidance, and high performance and insensitive explosives. Efforts in this program have been coordinated through the Reliance 21 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 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	61.330	60.692	64.676	-	64.676
Current President's Budget	60.365	60.656	77.175	-	77.175
Total Adjustments	-0.965	-0.036	12.499	-	12.499
• Congressional General Reductions	-	-0.036			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.550	-			
• SBIR/STTR Transfer	-0.883	-			
• Other Adjustments	-0.632	-	12.499	-	12.499

Change Summary Explanation

FY11: Other Adjustments include -0.632 Congressional General Reductions

FY13: Increase due to higher Air Force priorities

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622068: *Advanced Guidance Technology*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
622068: *Advanced Guidance Technology*	19.555	20.820	32.955	-	32.955	34.081	34.227	35.884	35.565	Continuing	Continuing

Note

In FY 2013, changes in funding are due to higher AF priorities.

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	1.893	2.024	4.487	-	4.487
Description: Develop advanced seeker technologies for air-delivered munitions to provide high confidence target discrimination and classification, precise target location, and robust terminal tracking.					
FY 2011 Accomplishments: Completed model verification and demonstration of optical seeker technologies to improve targeting of obscure targets. Continued development and evaluation of test components for laser ranging, multi-mode, and synthetic aperture and high resolution radar seeker technologies for guidance in adverse weather. Continued developing theory for seeker/sensor fusion, autonomous target recognition using differential geometry and topology, and application of neurophysiology of insects to guide small vehicles to moving targets. Investigated guidance technologies that optimize delivery of selectable effects munitions through countermeasures. Began development of seeker technology for adverse weather capability for small weapons, hypersonic environments, and discriminating tunnels and surface aimpoints for boosted/high speed penetrators.					
FY 2012 Plans: Continue laboratory development and evaluation of test components for laser ranging, improved multi-mode, adverse weather synthetic aperture and high resolution radar modes seekers. Begin technology development of very low-cost, adverse weather capable, radar seeker for small weapons. Develop theory for seeker sensor fusion and autonomous target recognition, and study multi-weapon and conformal apertures for enhanced					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622068: *Advanced Guidance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
resolution and beam forming on small cooperative weapons. Continue applying the neurophysiology of insects to guide small vehicles to moving targets, investigate guidance technologies that optimize delivery of selectable effects munitions through countermeasures and develop dual mode seeker for hypersonic environments and discriminating tunnels and surface aimpoints for boosted/high-speed penetrators. ***FY 2013 Base Plans:*** 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. Increase emphasis on seeker technologies that provide enhanced mission capability for fifth-generation aircraft, specifically as it applies to success in denied or anti-access environments. Continue developing algorithms and processing technologies to acquire and track targets with and without an operator in the loop. Continue pursuing revolutionary bio-inspired seeker technologies to increase immunity to countermeasures, to exploit multi-discriminant signatures, and to reduce the size and cost of detectors. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 2 ***Description:*** Develop advanced weapon aerodynamic, control, navigation, and networking technologies for air-delivered munitions to provide precise, agile flight, networked effects, and immunity to countermeasures. ***FY 2011 Accomplishments:*** Continued developing and evaluating advanced weapon airframe and control concepts to achieve high levels of agility and maneuverability, developing multi-functional structures, and evaluating navigation systems within Global Positioning System (GPS) jamming environments. Continued development of algorithms to use wide field-of-view optical imager data, enabling navigation under GPS-denied conditions. Determined feasibility of highly compact, high throughput avionics processors and mature technologies allowing weapons to communicate and exploit information in a secure, low probability of detection mode with launch platforms, other weapons, and/or ground elements. Began developing robust control methodologies for terminal guidance and control and actuation technologies for future weapon concepts. ***FY 2012 Plans:*** Continue developing advanced weapon airframe and control concepts to achieve high levels of agility and maneuverability, developing multi-functional structures, and evaluating navigation mode with other systems. Continue developing nonlinear, robust control methodologies for future weapons, such as high-speed terminal	8.773	9.338	15.356	-	15.356

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622068: *Advanced Guidance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
guidance on long-range strike weapons and control and actuation technologies for boosted penetrators systems within GPS jamming environments. Continue development of algorithms to use wide field-of-view optical imager data, enabling navigation under GPS-denied conditions. Develop highly compact, high throughput avionics processors, and continue maturing technologies allowing weapons to communicate and exploit information in a secure, low probability of detection. ***FY 2013 Base Plans:*** Continue developing technologies that achieve precision navigation under GPS-degraded and GPS denied conditions. Identify and pursue additional weapon navigation and control networking technologies that provide 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. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 3 ***Description:*** Develop guidance subsystem integration and evaluation technologies to provide open and closed loop ground testing, flight test risk reduction, and digital simulation of advanced concepts. ***FY 2011 Accomplishments:*** Continued investigating precision guided munition integration technology issues and functionality in various flight environments and refining the set of interoperable simulations to evaluate emerging munitions guidance technologies. Continued evaluating multi-weapon search and attack technologies on a time critical moving target. Simulated highly innovative concepts and approaches in guidance and control technology, and develop capability to test and refine development programs and future weapon concepts in a realistic operational environment. Began development of seeker scene projection technologies and dynamic simulation technologies for terminally guided weapons. ***FY 2012 Plans:*** Investigate precision guided munition integration technology issues and functionality in various flight environments and refine the set of interoperable simulations to evaluate emerging munitions technologies. Simulate highly innovative concepts and approaches in guidance and control technology. Develop capability to test and refine development programs and future weapon concepts in a realistic operational environment.	8.889	9.458	13.112	-	13.112

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Continue multi-weapon search and attack technologies on a time critical moving target. Begin build-up of test technologies for evaluating higher speed weapon guidance subsystem. ***FY 2013 Base Plans:*** Develop precision guided munition integration technology issues and functionality. Expand efforts to develop the capability to simulate, test, and refine innovative seeker concepts and navigation and control approaches in a realistic operational environment. Increase emphasis on guidance integration and evaluation technologies that provide enhanced mission capability for fifth-generation aircraft. Continue pursuing multiweapon search and attack technologies on a time critical moving target. Continue the build-up of test technologies for evaluating higher speed weapon guidance subsystems. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	19.555	20.820	32.955	-	32.955

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622502: *Ordnance Technology*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
622502: *Ordnance Technology*	40.810	39.836	44.220	-	44.220	50.081	49.728	48.764	52.166	Continuing	Continuing

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 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1.	5.743	5.586	6.267	-	6.267
Description: Investigate and develop energetic materials technology that can maximize weapon lethality, while applying appropriate safety and security features.					
FY 2011 Accomplishments: Completed the materials properties database to develop system level models for predicting initiation. Tested and modeled explosive fills that reduce pre-detonation during high "G" loading. Developed low-density energetic materials for micro-munitions applications. Investigated high-density case materials to tailor or improve warhead performance.					
FY 2012 Plans: Test and model explosive fills that reduce pre-detonation during high "G" loading. Develop low-density energetic materials for micro-munitions applications. Investigate high-density case materials to tailor or improve warhead performance.					
FY 2013 Base Plans: Develop, model, and test explosive fills that reduce pre-detonation during high "G" loading. Continue developing low density energetic materials for small munition applications. Exploit new nanoenergetic materials to enhance and tailor explosive effects. Increase emphasis on developing energetic materials that enable increased capability and capacity for fifth-generation aircraft.					
FY 2013 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622502: *Ordnance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 2. ***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 2011 Accomplishments:*** Continued investigating novel methods to initiate explosives, including new modeling and testing techniques. 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. Continued development of a hardened chip fuze that uses integrated logic. ***FY 2012 Plans:*** Continue investigating novel methods to initiate explosives, including new modeling and testing techniques. Continue to investigate and characterize the mechanical environment that a fuze must survive during hard target penetration events. Continue to explore ground profiling imaging fuze technology. Continue development of a hardened chip fuze that uses integrated logic. ***FY 2013 Base Plans:*** Expand effort to investigate novel methods to initiate explosives, including new modeling and testing techniques. Increase 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. Continue to investigate and characterize the mechanical environment that a fuze must survive during hard target penetration events. Continue to explore ground profiling imaging fuze technology, and develop a hardened chip fuze that uses integrated logic. ***FY 2013 OCO Plans:*** N/A	6.226	6.068	9.252	-	9.252
Title: Major Thrust 3. ***Description:*** Investigate and develop advanced warhead kill mechanisms, such as adaptable warheads, directional control, fragmenting warheads, and application of reactive metals. ***FY 2011 Accomplishments:***	6.958	6.787	6.824	-	6.824

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Developed compact lethality warhead technologies for use in urban terrain. Continued investigating directional warhead concepts employing reactive fragments to improve standoff kills for non-direct hit encounters. Continued developing numerical algorithms for material-to-material interface dynamics, loading, and vibration during high-speed penetration. Continued investigating techniques to control, direct, and focus the energy release from explosives in real-time by means of applying small amounts of electromagnetic energy. Investigated novel warhead designs that provide warfighting capability to deliver selectable effects on targets. ***FY 2012 Plans:*** Develop compact lethality warhead technologies for use in urban terrain. Continue investigating directional warhead concepts employing reactive fragments to improve standoff kills for non-direct hit encounters. Continue developing numerical algorithms for material-to-material interface dynamics, loading, and vibration during high-speed penetration. Continue investigating techniques to control, direct, and focus the energy release from explosives in real-time by means of applying small amounts of electromagnetic energy. Investigate novel warhead designs that provide warfighting capability to deliver selectable effects on targets. ***FY 2013 Base Plans:*** Continue developing novel warhead technologies, especially those that enable small, agile munitions or that provide the capability to deliver selectable effects on targets. Continue investigating directional warhead concepts to improve standoff kills for non-direct hit 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 2013 OCO Plans:*** N/A					
Title: Major Thrust 4. ***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 2011 Accomplishments:*** Continued investigation of precision guided munition integration issues and functionality in various flight environments. Continued building and using interoperable simulations to evaluate emerging technologies.	21.883	21.395	21.877	-	21.877

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602602F: *Conventional Munitions*	PROJECT 622502: *Ordnance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Continued developing and enhancing new models and improvements for micromunitions, penetrators, and counter-chemical, biological, radiological, and nuclear effects. ***FY 2012 Plans:*** Continue investigation of precision guided munition integration issues and functionality in various flight environments. Continue building and using interoperable simulations to evaluate emerging technologies. Continue developing and enhancing new models and improvements for micromunitions, penetrators, and counter-chemical, biological, radiological, and nuclear effects. ***FY 2013 Base Plans:*** Continue investigation of precision guided munition integration issues and functionality in various flight environments. Continue building and using interoperable simulations to evaluate emerging technologies. Continue developing and enhancing new models and improvements for small munitions, penetrators, and counter chemical, biological, radiological, and nuclear effects. Increase emphasis on advanced ordnance concepts that increase the capacity and capability of fifth-generation aircraft. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	40.810	39.836	44.220	-	44.220

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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.