Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Air Force										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	115.369	117.283	127.866	-	127.866	129.579	132.253	134.768	137.384	Continuing	Continuing
625315: *Connectivity and Protection Tech*	45.882	46.780	52.547	-	52.547	52.594	53.237	53.953	48.062	Continuing	Continuing
625316: *Info Mgt and Computational Tech*	33.258	30.804	32.108	-	32.108	31.807	34.269	35.087	38.752	Continuing	Continuing
625317: *Information Decision Making Tech*	16.660	18.835	17.727	-	17.727	18.443	20.044	20.105	20.528	Continuing	Continuing
625318: *Operational Awareness Tech*	19.569	20.864	25.484	-	25.484	26.735	24.703	25.623	30.042	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops enterprise-centric information technology for the Air Force. Advances in enterprise-centric information technologies are required to increase warfighter readiness and effectiveness by providing the right information, at the right time, in the right format, anytime, anywhere in the world. The Connectivity and Protection Tech project provides the technologies for: multi-level, secure, seamless networks; advanced communications processors; anti-jam and low probability of intercept techniques, as well as technologies that deter any adversary from attacking computer systems while allowing access to, presence on, manipulation of, and operational effects on adversary computer systems. This project also develops the technology base for the next generation of ultra-wide-bandwidth, multi-channeled, air and space-based communications networks. The Info Mgmt and Computational Tech project provides advances in information management and dissemination technologies to ensure the delivery of high-quality, timely, secure information to the warfighter, and develop technologies to produce both advanced on-demand computational processing and computer architectures with greater capacity and sophistication for addressing dynamic mission objectives under constraints imposed by AF systems. The Information Decision Making Tech project develops the technology to support the commander and staff's ability to command all viable options to achieve desired effects across the full spectrum of operations. The Operational Awareness Tech project develops technologies that improve their capability to generate, process, manage, fuse, exploit, interpret, and disseminate timely and accurate information. This program has been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication. This program is in Budget Activity 2, since it develops and demonstrates the technical feasibility and military utility of evolutionary and revolutionary technologies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Air Force	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602788F: *Dominant Information Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	116.785	117.283	129.320	-	129.320
Current President's Budget	115.369	117.283	127.866	-	127.866
Total Adjustments	-1.416	-	-1.454	-	-1.454
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.420	-			
• Other Adjustments	0.004	-	-1.454	-	-1.454

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2010	FY 2011
Project: 625315: *Connectivity and Protection Tech*		
Congressional Add: *Efficient Utilization of Transmission Hyperspace.*	1.992	-
Congressional Add Subtotals for Project: 625315	1.992	-
Congressional Add Totals for all Projects	1.992	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
625315: *Connectivity and Protection Tech*	45.882	46.780	52.547	-	52.547	52.594	53.237	53.953	48.062	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires technologies that enable assured, worldwide communications for an agile Expeditionary Aerospace Force (EAF). These communication technologies will provide en-route and deployed reachback communications for distributed collaborative military operations. This project provides the technologies for secure, self-configuring, self-healing, seamless networks; advanced communications processors; anti-jam and low probability of intercept communications techniques; agile, dynamic policy based network management capabilities; and modular, programmable, low-cost software radios. This project also develops both the technology base for the next generation of ultra-wide bandwidth, multi-channeled air and space-based communications networks on and between platforms using the technologies for implementing photonic chip scale optical Code Division Multiple Access (CDMA) and Wavelength Division Multiplexed (WMD) transceivers and prototype networks associated with advanced fiber optics and the technology to integrate current Radio Frequency (RF) with high data rate Optical Laser communications, along with network management techniques, tools, and software to support them. In addition, the Air Force requires technologies to deliver a full range of options in cyberspace at par with air and space dominance in each of the areas of cyber attack, cyber defense, and cyber support to achieve the strategic capability of cyber dominance. This project provides the technologies required to successfully deter any adversary from attacking computer systems anytime, anywhere by ensuring the Air Force's ability to: 1) access, maintain presence on, and deliver effects to adversary systems; 2) detect, defend, and respond to attacks on friendly computer systems as well as provide forensic analysis concerning those attack attempts; and 3) provide cyber situational awareness to Air Force commanders.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	24.036	21.481	20.725	-	20.725
Description: Develop improved, survivable, higher bandwidth communications, networking, and signal processing technologies to provide secure, adaptive, covert, anti-jam, and assured global battlespace connectivity. ***FY 2010 Accomplishments:*** Completed demonstrations of: 1) an automated reasoning network management agent system, 2) an assured access, anti-jam communications capability that combines multi-dimensional (space, time, frequency, coding) transmission techniques and cognitive networking technology, and 3) an advanced, automated, wireless airborne networking and communications link emulation capability. Developed low probability of intercept, low probability of detection waveform for hand held multi data rate radio. Initiated development of capability to enhance both trust and V/W band (50GHz to 110 GHz) within airborne networks, and leading wireless protocols					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
for use in the remotely piloted aircraft environment. Initiated in-house and university development of next generation advanced networking technologies for distributed military operations in an airborne environment. ***FY 2011 Plans:*** Continue in-house and university development of next generation advanced networking technologies for distributed military operations in an airborne environment. Complete development of low probability of intercept, and low probability of detection waveform for hand held multi data rate radio which has a small form-factor networking and reachback capability with reduced size, weight, and power. Complete development of capability to enhance trust within airborne networks and leading wireless protocols for use in the remotely piloted aircraft environment and continue development of capability for increased V/W bandwidth communication to a variety of airborne platforms. Initiate investigation of mission essential functions, including mini-Common Data Link, assessing threat tolerance in contested environments, and developing mitigation strategies to alleviate risk due to cyber vulnerabilities. Initiate both development of secure video distribution over tactical internets on demand and design of optimized, distributed, cross-layer protocol stacks for cognitive radio ad hoc networks with decentralized control. Initiate investigation of spatial multiplex multiple-input and multiple-output (MIMO) techniques to increase channel capacity and the development of a cognitive cooperation protocol for wireless networks. ***FY 2012 Base Plans:*** Continue in-house and university development of next generation advanced networking technologies for distributed military operations in an airborne environment. Continue both development of secure video distribution over tactical internets on demand and design of optimized, distributed, cross-layer protocol stacks for cognitive radio ad hoc networks with decentralized control. Continue investigation of spatial multiplex multiple-input and multiple-output (MIMO) techniques to increase channel capacity and the development of a cognitive cooperation protocol for wireless networks. Complete development of capability for increased V/W bandwidth communication and characterization to a variety of airborne platforms with varying data rates. Complete investigation of mission essential functions, including mini-CDL, assessing threat tolerance in contested environments, and developing mitigation strategies to alleviate risk due to cyber vulnerabilities. ***FY 2012 OCO Plans:***					
Title: Major Thrust 2. ***Description:*** Develop cyber defense and supporting technologies to detect, defend, and respond to attacks on computer systems as well as provide forensic analysis concerning the attacks.	3.082	4.910	5.367	-	5.367

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
FY 2010 Accomplishments: Completed investigation of cyber defense metrics and their applicability to increase situational awareness of enterprise systems and malicious activities occurring therein. Initiated development of technology to assure operations of our networked forces (a trusted execution environment) in high threat, contested cyber environments by demonstrating a trusted cyber delivery vehicle/platform to support nearly all types cyber operations. Initiated development of technologies to support the ability to avoid cyber attacks by increasing redundancy, diversity, and agility in AF networks to disrupt adversary attack planning by pursuing defensive cyber maneuver and agility, polymorphic code development, and concealment and obfuscation of our networks. Completed development of technology to provide a trusted verification of information system hardware resources. Initiated the development of remote rendering services and thin client technology to protect end user information systems from network-delivered threats. ***FY 2011 Plans:*** Continue development of technology to assure operations of our networked forces (a trusted execution environment) in high threat, contested cyber environments by demonstrating a trusted cyber delivery vehicle/platform to support nearly all types cyber operations. Continue development of technologies to support the ability to avoid cyber attacks by increasing redundancy, diversity, and agility in AF networks to disrupt adversary attack planning by pursuing defensive cyber maneuver and agility, polymorphic code development, and concealment and obfuscation of our networks. Complete the development of remote rendering services and thin client technology to protect end user information systems from network-delivered threats. ***FY 2012 Base Plans:*** Continue development of technology to assure operations of our networked forces (a trusted execution environment) in high threat, contested cyber environments by demonstrating a trusted cyber delivery vehicle/platform to support nearly all types cyber operations. Complete development of technologies to support the ability to avoid cyber attacks by increasing redundancy, diversity, and agility in AF networks to disrupt adversary attack planning by pursuing defensive cyber maneuver and agility, polymorphic code development, and concealment and obfuscation of our networks. ***FY 2012 OCO Plans:***					
Title: Major Thrust 3. ***Description:*** Develop offensive cyber operations technologies to access, maintain presence on, and deliver effects to adversary systems.	6.458	9.390	14.338	-	14.338

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
FY 2010 Accomplishments: Developed information system access methods and development of propagation techniques. Developed stealth and persistence technologies including efforts to develop autonomic technologies for operating within adversary information systems. Initiated development of the capability to exfiltrate information from adversary information systems and developed methods for increased cyber situational awareness and understanding of the battlefield. Developed technology to deliver D5 (deceive, deny, disrupt, degrade, and destroy) effects in concert with cyber platforms. Initiated development of ability to identify foreign languages as a part of a cyber intelligence (CybINT) capability. ***FY 2011 Plans:*** Continue development of information system access methods and development of propagation techniques. Continue development of the capability to exfiltrate information from adversary information systems, continue development of methods for increased cyber situational awareness and understanding of the battlefield and initiate development of methods for covert data exchange. Continue development of technology to deliver D5 effects in concert with cyber platforms. Continue development of stealth and persistence technologies to include autonomic technologies for operating within adversary information systems. Complete demonstrated ability to identify foreign languages as a part of a CybINT capability. ***FY 2012 Base Plans:*** Continue development of information system access methods and development of propagation techniques. Continue development of stealth and persistence technologies and initiate investigation into anti-reverse engineering methods. Continue development of the capability to exfiltrate information from adversary information systems, continue development of methods for increased cyber situational awareness and understanding of the battlefield, and continue the development of methods for covert data exchange. Continue development of technology to deliver D5 effects in concert with cyber platforms. Initiate development of a publish/subscribe architecture for exchange and exfiltration of information while operating within adversary information systems. ***FY 2012 OCO Plans:***					
Title: Major Thrust 4. ***Description:*** Develop methods and technologies for controlled operation of information systems during attacks and fault conditions, minimizing vulnerabilities of cyber attacks, and guaranteeing the correctness of data and codes.	3.645	9.233	6.672	-	6.672

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
FY 2010 Accomplishments: Initiated development of assured end-to-end quality of service (QoS) and quality of information assurance (QoIA) integration to the information system during attacks and faults to provide the ability to degrade gracefully in a controlled trade space. Developed a resilient and self-regenerating information enterprise that dynamically recognizes, characterizes, and understands novel cyber attacks and service anomalies, aids in the creation of synthetically diverse, functionally equivalent software, and continuously monitors, reconfigures, and self optimizes the mission critical enterprise to resist new attacks. Initiated challenge problem in-house and university research investigations for development of cyber domain capabilities supporting AF information systems. Developed defensive techniques for wireless, mobile, and embedded systems. ***FY 2011 Plans:*** Complete development of assured end-to-end QoS and QoIA integration to the information system during attacks and faults to provide the ability to degrade gracefully in a controlled trade space. Continue development of a resilient and self-regenerating information enterprise and initiate development of automatic machine regeneration of software to recover with immunity from cyber attack. Continue challenge problem in-house and university research investigations for development of cyber domain capabilities supporting AF information systems including research in assured cyber operations in complex networks. Investigate information assurance tenants in infrastructure as a service cloud environment, concentrating on ensuring secure processing, data storage and communication in a cloud. Continue to develop defensive techniques for wireless, mobile, and embedded systems. Initiate development of methods for disruption of malware and covert channels in data transmissions without having to detect whether malware or covert channels exist in the transmission. ***FY 2012 Base Plans:*** Complete development of methods for disruption of malware and covert channels in data transmissions without having to detect whether malware or covert channels exist in the transmission. Initiate development of defensive cyber technologies to increase system survivability while under a cyber attack. Complete development of a resilient and self-regenerating information enterprise and continue development of automatic machine regeneration of software to recover with immunity from cyber attack. Continue challenge problem in-house and university research investigations for development of cyber domain capabilities supporting AF information systems including research in assured cyber operations in complex networks. Complete investigation of information assurance tenents in infrastructure as a service cloud environments, concentrating on ensuring secure processing, data storage and communication in a cloud. Complete development of defensive techniques					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
for wireless, mobile, and embedded systems with vulnerability analysis and threat identification for emerging commercial wireless standards. ***FY 2012 OCO Plans:***					
Title: Major Thrust 5. ***Description:*** Develop and assess optical network technologies for application in the space environment, including existing and emerging modulation schemes and protocols, for use in space-based optical networks and develop flight ready systems consisting of high capacity RF and optical components and architectures for next generation platform communications for avionics and satellite systems and wireless in-flight communications systems. ***FY 2010 Accomplishments:*** Designed and developed a flight test system with a Dense Wavelength Division Multiplexed (DWDM) broadcast architecture as well as a 40 channel multi wavelength optical network for on-board air and space applications. Characterized high throughput RF waveform data link technology, and initiated development of optical communications link hardware and software for flight testing. ***FY 2011 Plans:*** Complete in-flight verification of the DWDM single mode system by testing data integrity, switching times and latency, total throughput, reconfigurability, bit error rates, and wavelength to wavelength switching during flight operations, and complete development of 40 channel multi wavelength optical network for on-board air and space applications. Continue ground tests of RF waveform generation to demonstrate high capacity persistent sensor data transmission, and complete the fabrication, integration and flight tests of flight test ready optical data link system. ***FY 2012 Base Plans:*** Initiate development of an all-optical communications system for airborne and satellite platforms, that can distribute very high rate digital data and RF signals in high shock, vibration, and radiation environments. Initiate development of next generation of high capacity data links supporting transmission requirements of airborne and spaceborne sensors. Continue ground tests of RF waveform generation to demonstrate high capacity persistent sensor data transmission. ***FY 2012 OCO Plans:***	6.669	1.766	5.445	-	5.445

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625315: *Connectivity and Protection Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Accomplishments/Planned Programs Subtotals	43.890	46.780	52.547	-	52.547

	FY 2010	FY 2011
Congressional Add: Efficient Utilization of Transmission Hyperspace.	1.992	-
FY 2010 Accomplishments: Conducted Congressionally-directed effort.		
FY 2011 Plans:		
Congressional Adds Subtotals	1.992	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625316: *Info Mgt and Computational Tech*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
625316: *Info Mgt and Computational Tech*	33.258	30.804	32.108	-	32.108	31.807	34.269	35.087	38.752	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires the capability to maximize the value, sharing, management, and use of its information and information assets in achieving its mission objectives as the importance of information grows in the current net centric environment. Technology development in this project must be capable of taking advantage of future net-centric environments including new structured and ad hoc processes in response to rapidly changing warfare challenges. Advances in robust information management focus on quality of service and flow of information within the enterprise, information transformation and brokering, secure information sharing across and among domains, and collaboration of workflow within the enterprise. Technologies addressed in this project include the ability to globally share, discover, and access information across organizational, functional, and coalition boundaries and between and among domains, the timely delivery of information to tactical assets, the tailoring and prioritization of information based on mission needs and importance, and the scaling, robustness, and collaboration features required of the Air Force net-centric information management environment. In addition, the Air Force requires the development of superior, intelligent, on-demand computing to enable information superiority. Technology development in this project focuses on producing: 1) computer architectures with greater capacity and sophistication for addressing constrained, dynamic mission objectives, 2) "game-changing" computing power to the warfighter, 3) disruptive computing technology power at the edge and the power behind grid services, and 4) interactive and real-time computing improving the usability of high performance computing to the Air Force. It includes technologies in computational sciences and engineering, computer architectures, and software intensive systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	14.339	7.530	2.766	-	2.766
Description: Investigate and develop technologies for decision quality information dissemination services via publish, subscribe, and query with coalition partners as part of the Global Information Grid (GIG).					
FY 2010 Accomplishments: Developed secure cross domain discovery and sharing of web services. Completed development of content-based dissemination mechanisms and quality of service provisioning. Initiated development of mechanisms to federate and share information across disbursed locations and establish the means to maintain provenance and authoritative control over the information and complete development of prioritized queuing mechanisms to maximize value of delivered information based upon its context. Initiated research of service oriented architecture (SOA) based architectures and services for tactical and enterprise environments that are secure, survivable and resilient to cyber attack and failures.					
FY 2011 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625316: *Info Mgt and Computational Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Initiate development of tools and safeguards required to quickly and reliably transfer information from a higher classification domain to a lower classification domain, as well as to coalition partners. Complete development of secure cross-domain information brokering for the discovery and sharing of web services. Continue research of service oriented architecture (SOA) based architectures and services for tactical and enterprise environments that are secure, survivable, and resilient to cyber attack and failures. Complete research into dynamic information management system infrastructure. ***FY 2012 Base Plans:*** Continue development of tools and safeguards required to quickly and reliably transfer information from a higher classification domain to a lower classification domain, as well as to coalition partners. Complete research of service oriented architecture (SOA) based architectures and services for tactical and enterprise environments that are secure, survivable, and resilient to cyber attack and failures. ***FY 2012 OCO Plans:***					
Title: Major Thrust 2 ***Description:*** Develop collaborative services technologies and virtual environments to facilitate the development and fielding of next generation decision support systems. ***FY 2010 Accomplishments:*** Based on study results, began development of an information service orchestration framework that leverages open system standards and technologies to implement workflow capabilities that can adapt the execution of information services to the changing requirements of dynamic military environments. ***FY 2011 Plans:*** ***FY 2012 Base Plans:*** ***FY 2012 OCO Plans:***	0.649	-	-	-	-
Title: Major Thrust 3. ***Description:*** Develop automatic and dynamically reconfigurable, affordable, scalable, distributed petaflop processing technologies for real-time global information systems. ***FY 2010 Accomplishments:***	7.934	9.074	14.161	-	14.161

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625316: *Info Mgt and Computational Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Initiated the development of high capacity processing on demand which will reduce the ever increasing amounts of raw data to actionable information by evaluating current processor functionality and identify functionality necessary for system on chip capability. Initiated scalable quantum information science testbed for optimized information searching and processing by developing algorithms and simulations of select computationally challenging and relevant problems. Initiated development of next generation advanced computing techniques, enabling superior information processing for AF warfighters through in-house and university research. Initiated development of advanced processing capabilities to enable the collection and processing of information as close to the sensor as feasible. Initiated nano-computer technology development to provide high performance, secure, scalable, and survivable information dissemination. ***FY 2011 Plans:*** Complete development of algorithms and simulations of select computationally challenging and relevant problems in the scalable quantum information science testbed for optimized information searching and processing. Continue research of petaflops embedded processing on-demand and multi-core computing by completing the design and the fabrication of a prototype for increased control of power. Continue development of next generation advanced computing techniques, enabling superior information processing for AF warfighters through in-house and university research. Continue development of advanced processing capabilities to enable the collection and processing of information as close to the sensor as feasible. Complete nano-computer technology development to provide high performance, secure, scalable, and survivable information dissemination. Initiate study of quantum cores as the foundational building blocks for a multi-core quantum processor. Initiate study of reconfigurable electronics to enable intelligent AF systems to perform autonomous operations. ***FY 2012 Base Plans:*** Continue development of next generation advanced computing techniques, enabling superior information processing for AF warfighters through in-house and university research. Complete study of reconfigurable electronics to enable intelligent AF systems to perform autonomous operations. Continue development of tools to analyze codes and dynamic execution profiles and extract threads suitable for multi-core computation. Complete development of advanced processing capabilities to enable the collection and processing of information as close to the sensor as feasible. Continue development of petaflops embedded processing on-demand and multi-core computing by demonstrating increased control of power of fabricated prototype. Continue study of quantum cores as the foundational building blocks for a multi-core quantum processor. ***FY 2012 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625316: *Info Mgt and Computational Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 4.	5.839	8.592	8.776	-	8.776
Description: Develop secure cross domain discovery services for access to services outside of existing domain. Develop the tools to allow collaboration of workflows required by the AF net-centric information management environment. ***FY 2010 Accomplishments:*** Initiated investigation of current lightweight directory access protocol (LDAP) best practices and design multi-level LDAP capability. Initiated development of flexible sensor interfaces to support rapid sensor replacement and configuration without modification of backend hardware or software infrastructure and develop prioritized delivery mechanisms by integrating information management and networking complementary capabilities. Researched cross domain information sharing technologies by investigating cognitively assisted information technologies to provide automated assistance to the current labor-intensive process of human review and release of sensitive information to other security domains and enclaves. Initiated development of novel information management techniques as applied to all domains through in-house and university research leading to enhanced information flow across the net-centric assets of the GIG. ***FY 2011 Plans:*** Complete implementation of multi-level LDAP prototype solution into a fully SOA compliant architecture, leveraging the existing multi-level repository (MLR) technology. Continue development of a flexible fusion container to allow upstream processing without affecting core critical infrastructure and demonstrate its application to tracking of evasive non-linear targets. Initiate development of advanced technologies to effectively manage large data storage warehouses within agile enterprise environments by developing quality of service enabled information management services coupled to network routing and management for tactical edge IP-based networks. Complete research efforts to improve the timeliness and accuracy of the human review process using advanced information technology Continue development of novel information management techniques as applied to all domains through in-house and university research leading to enhanced information flow across the net-centric assets of the GIG. Develop information management capabilities in support of force protection. ***FY 2012 Base Plans:*** Initiate development of an automated security annotation framework that provides safeguarding mechanisms for the AF enterprise. Complete an open architecture for the efficient integration of sensors, algorithms, and computing and communications hardware to support real-time tactical information collection, exploitation, and					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625316: *Info Mgt and Computational Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
command and control. Complete development of advanced technologies to effectively manage large data storage warehouses within agile enterprise environments by developing quality of service enabled information management services coupled to network routing and management for tactical edge IP-based networks. Continue development of novel information management techniques as applied to all domains through in-house and university research leading to enhanced information flow across the net-centric assets of the GIG Continue to develop information management capabilities in support of force protection. ***FY 2012 OCO Plans:***					
Title: Major Thrust 5. ***Description:*** Develop the architectural mechanisms that form the basis for predictable software and high assurance systems. ***FY 2010 Accomplishments:*** Initiated development and design of a modular trusted computing base architecture composed of the foundational hardware and software necessary to ensure overall system security. Developed the tools, techniques, standards, and technologies required to build highly complex software-intensive systems. Initiated architectures for cognitive systems by identifying nodal design hierarchy for modular systems. Initiated development of a trusted, automated cyber defense capability to reduce response time down to milli-seconds vice hours. ***FY 2011 Plans:*** Complete prototype design and demonstrate functionality of a modular trusted computing base architecture. Continue development of a trusted, automated cyber defense capability to reduce response time down to milli-seconds vice hours. Continue the development of the tools, techniques, standards, and technologies required to build highly complex software-intensive systems. Complete architectures for cognitive systems and demonstrate hierarchical prototype. Initiate development of a co-design of a multi-core Tagged Secure Processor, a Zero-Kernel Operating System, and Application Development Environment inherently resistant to malicious software and inherently compliant with multiple-independent-levels-of-security (MILS) systems. Initiate design of a hybrid complementary metal-oxide semiconductor (CMOS)/memristor logic unit that is compact and efficient for encryption algorithm implementation. ***FY 2012 Base Plans:***	4.497	5.608	6.405	-	6.405

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602788F: *Dominant Information Technology*	**PROJECT** 625316: *Info Mgt and Computational Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Initiate developing architectures for a compact large array of many node clusters with very low power demand for intelligent systems. Complete development of trusted, automated cyber defense capability to reduce response time down to milli-seconds vice hours. Continue development of a co-design of a multi-core Tagged Secure Processor, a Zero-Kernel Operating System, and Application Development Environment inherently resistant to malicious software and inherently compliant with multiple-independent-levels-of-security (MILS) systems. Continue design of a hybrid complementary metal-oxide semiconductor (CMOS)/memristor logic unit that is compact and efficient for encryption algorithm implementation. Continue the development of the tools, techniques, standards, and technologies required to build highly complex software-intensive systems including correct concurrent code for trusted embedded multi-core systems. ***FY 2012 OCO Plans:***					
Accomplishments/Planned Programs Subtotals	33.258	30.804	32.108	-	32.108

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625317: *Information Decision Making Tech*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
625317: *Information Decision Making Tech*	16.660	18.835	17.727	-	17.727	18.443	20.044	20.105	20.528	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires advances in technologies enabling the effective execution of military objectives that will vastly improve the ability to support the commander and staff's ability to command all viable options to achieve desired effects across the full spectrum of operations (air, space, and cyberspace) at all levels of war (strategic, operational, and tactical) and during all phases of conflict (pre-conflict, conflict through stability operations). Technology development in this project addressing this requirement include anticipatory decision support and course of action development, planning, scheduling and assessment, and the real time effective portrayal of complex data sets.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	4.972	7.791	8.995	-	8.995
Description: Develop next generation monitoring, planning, and assessment technologies enabling aerospace commanders to develop effects based campaigns. ***FY 2010 Accomplishments:*** Completed the development of capability for a full-spectrum analysis for effects attainment at all levels of a campaign, linking leading indicators to desired and undesirable effects. Initiated development of the capability, including wargaming technologies, to mix kinetic and non-kinetic options, incrementally forecast the direct and indirect effects of each COA, and play COAs forward in time to identify key plan dependencies, decision points, and the foreclosure of options. Initiated investigation of methods to seamlessly move between geospatial and non-geospatial data to enhance situational awareness and enable integrated decisions over the air, space, and cyber domains. ***FY 2011 Plans:*** Initiate the development of capability for a full-spectrum analysis for effects attainment at all levels of a campaign, linking leading indicators to desired and undesirable effects. Continue to develop and begin demonstrating capabilities, including wargaming technologies, to mix kinetic and non-kinetic options, continuously forecast the direct, indirect, and cascading effects of each COA, and play COAs forward in time to identify key plan dependencies, decision points, and the foreclosure of options. Initiate the development and demonstration of decision workflow and workload management capabilities to manage the command and control constellation of resources focused on specific missions. Complete investigation of methods to seamlessly move					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625317: *Information Decision Making Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
between geospatial and non-geospatial data to enhance situational awareness and enable integrated decisions over the air, space, and cyberspace domains. ***FY 2012 Base Plans:*** Initiate development of a hybrid war gaming concept of decision theory and game theory to provide safeguarded courses of action in adversarial environments with varying degrees of partial information. Complete development and demonstrate capabilities to mix kinetic and non-kinetic options, continuously forecast the direct, indirect, and cascading effects of each COA, and play COAs forward in time to identify key plan dependencies, decision points, and the foreclosure of options. Continue investigation of full-spectrum, quantitative analysis techniques that aid operational assessor's ability to link actions to effects to desired objectives. Continue the development and demonstration of decision workflow and workload management capabilities to analyze and prioritize courses of action for space control missions and space situational awareness. ***FY 2012 OCO Plans:***					
Title: Major Thrust 2. ***Description:*** Investigate, analyze, and develop technologies for planning, execution and automatic rapid reconfiguration of distributed intelligent and integrated C2 information systems to achieve the commander's intent throughout varying crisis levels. ***FY 2010 Accomplishments:*** Developed advanced interactive displays, including information visualizations, suitable for both high fidelity, accurate wargames and for rapid deployment in harsh environments with C2 applications and command centers. Completed development of the ability for timely kinetic/non-kinetic option generation, selection, and coordination capabilities that account for uncertainty and missing and erroneous information, and supports intuitive decision making process between man and machine collaborating on complex, dynamic problems. Conducted research to achieve the capability to analyze multiple courses of action (COA) having cascading effects in near real-time. Initiated in-house and university development of next generation planning, decision making, and COA tools supporting the commander's ability to exercise a wide range of command and execution options for AF forces. Initiated investigation of processes and technologies and recommend solutions to enable the Air and Space Operations Center (AOC) to conduct kinetic/non-kinetic Monitor, Assess, Plan, and Execute (MAPE) while under	11.688	11.044	8.732	-	8.732

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625317: *Information Decision Making Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
degraded conditions due to cyber attacks. Completed development of predictive decision support techniques for space command and control taskings. ***FY 2011 Plans:*** Complete development of advanced interactive displays, including information visualizations, suitable for both high fidelity, accurate wargames and for rapid deployment in harsh environments with C2 applications and command centers. Initiate development of capabilities to be more agile within a net centric enabled environment by developing models of cyber network attacks to enable better operation of cyber assets with air and space assets. Continue in-house and university development of next generation planning, decision making, and COA tools supporting the commander's ability to exercise a wide range of command and execution options for AF forces. Complete research to achieve the capability to analyze multiple COA having cascading effects in near real-time. Complete the investigation of processes and technologies and recommend solutions to enable the AOC to conduct kinetic/non-kinetic MAPE procedures while under degraded conditions due to cyber attacks. Develop the capability to rapidly integrate and analyze C2 systems within a developmental environment. Initiate development of a cooperative multi-agent system to maximize sensor task completions and provide an adaptive and flexible solution to deal with the dynamics of new asset task allocations. ***FY 2012 Base Plans:*** Continue development of capabilities to be more agile within a net centric enabled environment by developing models of cyber network attacks to enable better operation of cyber assets with air and space assets. Complete development of a cooperative multi-agent system to maximize sensor task completions and provide an adaptive and flexible solution to deal with the dynamics of new asset task allocations. Continue in-house and university development of next generation planning, decision making, and COA tools supporting the commander's ability to exercise a wide range of command and execution options for AF forces. ***FY 2012 OCO Plans:***					
Accomplishments/Planned Programs Subtotals	16.660	18.835	17.727	-	17.727

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625317: *Information Decision Making Tech*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625318: *Operational Awareness Tech*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
625318: *Operational Awareness Tech*	19.569	20.864	25.484	-	25.484	26.735	24.703	25.623	30.042	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires technologies that improve and automate their capability to generate, process, manage, fuse, exploit, interpret, and disseminate timely and accurate information. This project provides not only a network-centric, collaborative intelligence analysis capability that enables the fusion of multi-intelligence and sensor sources to provide timely situation awareness, understanding, and anticipation of the threats in the battle space, but also the advanced, novel exploitation technologies needed to intercept, collect, locate, and process both covert and overt raw data from intelligence and sensor sources. It leads the research, discovery, and development of technology that enables the fusion of multi-intelligence sources to provide accurate object tracking and ID, situational awareness, understanding, and anticipation of the threats in the battlespace (air, ground, space, and cyber). It also leads in the development of advanced exploitation technologies to maximize the intelligence gained from our adversaries in the areas of spectral detection and geolocation, signal recognition and analysis, and the data tagging, tracking, and tracing via the insertion of secure, imperceptible signal embedding for future fusion and understanding of the information.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	8.760	8.102	13.456	-	13.456
Description: Develop higher-level fusion and the enabling text information/knowledge base technologies to achieve situational awareness and understanding at all command levels for dynamic planning, assessment, and execution processes. ***FY 2010 Accomplishments:*** Completed Hybrid Multi-INT association algorithms based on contextual knowledge/advanced reasoning and complete experimentation of net centric fusion of pub/sub information environments. Explored tracking techniques in combination with Multi-INT feature data to improve the probability of correct association and extend track lifetimes for moving targets. Completed development of both the capability to utilize detected movement information and social network analysis to define and exploit the structure and behavior of the enemy and the techniques for analysis of audio sources as well as alternate sources by applying social network analysis metrics to determine high value targets. Completed development of automated reasoning techniques for assessing current situations using adversarial capabilities. Initiated development of techniques for analyzing and assessing activities to support situation assessment. Initiated in-house and university research dealing with level 1 - 4 fusion using multi-source intelligence and sensor feeds to advance the AF capability to anticipate the variety of threats from the ground, air, and cyber domains. Completed development of a framework for document level discourse analysis and inference based on information extracted from the text and ontological					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625318: *Operational Awareness Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
world knowledge. Initiated design of an automated feature aided tracking and pattern recognition capability for processing onboard a high-resolution, wide-area video staring sensor with cueing from lower bandwidth sensors. ***FY 2011 Plans:*** Complete demonstration of the ability to track targets, exploiting feature data, for an average of greater than 1 hour in moderate traffic density. Begin development and implementation of techniques to increase the scalability of tracking algorithms from 10's to 1000's of ground targets in a large rural-urban environment. Initiate development of techniques and algorithms to improve analysis of multi-sensor data for mining data across multi-INT repositories for behavioral patterns to identify terrorist networks and track movement and that process moving-target indication data from airborne sensors, and automatically classify airborne targets, including remotely piloted aircraft(RPA). Continue development of techniques for analyzing and assessing activities to support situation assessment. Continue in-house and university research dealing with level 1 - 4 fusion using multi-source intelligence and sensor feeds to advance the AF capability to anticipate the variety of threats from the ground, air, and cyber domains. Initiate development of automated generation of ontology from free-text or heterogeneous data sources and develop augmented analyst workflow techniques. Continue design of an automated feature aided tracking and pattern recognition capability for processing onboard a high-resolution, wide-area video staring sensor with cueing from lower bandwidth sensors. ***FY 2012 Base Plans:*** Continue development and implementation of techniques to increase the scalability of tracking algorithms from 10's to 1000's of ground targets in a large rural-urban environment. Initiate development of techniques for performing indications and warnings, pattern recognition, and information fusion for information exploitation. Continue development of techniques and algorithms to improve analysis of multi-sensor data for mining data across multi-INT repositories for behavioral patterns to identify terrorist networks and track movement and that process moving-target indication data from airborne sensors, and automatically classify airborne targets, including RPA. Complete design and demonstration of an automated feature aided tracking and pattern recognition capability for processing onboard a high-resolution, wide-area video staring sensor with cueing from lower bandwidth sensors. Continue in-house and university research dealing with level 1 - 4 fusion using multi-source intelligence and sensor feeds to advance the AF capability to anticipate the variety of threats from the ground, air, and cyber domains. Complete development of techniques for analyzing and assessing activities to support situation assessment. Initiate developing software to aid the analyst in determining the entity's behavior, including direction, speed, maneuvers, and operation of equipment. Complete development of					

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625318: *Operational Awareness Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
automated generation of ontology from free-text or heterogeneous data sources, and automated task suggestion in response to requests for intelligence information and assessments. ***FY 2012 OCO Plans:***					
Title: Major Thrust 2 ***Description:*** Develop digital information exploitation technologies for electronic communications and special signals intelligence, imagery, and measurement signatures to increase accuracy, correlation, and timeliness of the information. ***FY 2010 Accomplishments:*** Developed and evaluated watermarking techniques, extending to include streaming data and multimedia data technologies for additional applications. Developed audio processing technologies in the area of vocal tract modification. Initiated the development of algorithms to identify and classify an application layer (request/ reply) messaging protocol for supervisory control and data acquisition (SCADA) systems. Initiated in-house and university research in advanced exploitation techniques that maximize the AF ability to gather, process, and display information from multi-INT sources identifying threats to warfighters across the physical and cyber domains. Initiated the development of optimizing exploitation across sensors to enhance multi-intelligence fusion and a capability to detect and geo-locate surveillance and mobile threat emitters. ***FY 2011 Plans:*** Continue the development and evaluation of watermarking techniques for multimedia, beginning extensions to non-multimedia data and executable code. Complete SCADA protocols, integrate all algorithms, demonstrate and test a prototype analysis suite as an extensible proof-of-concept, and verify and validate algorithm performance against simulated real-world data. Continue in-house and university research in advanced exploitation techniques that maximize the AF ability to gather, process, and display information from multi-INT sources identifying threats to warfighters across the physical and cyber domains. Continue the development of optimizing exploitation across sensors to enhance multi-intelligence fusion and initiate investigation into a deeper understanding of and linguistic decomposition of tonal languages. Continue development of a capability to detect and geo-locate surveillance and mobile threat emitters and initiate investigation to perform specific emitter identification to exploit differences in transient characteristics and aid in intercept disambiguations. Initiate development of a signal processing methodology for exploiting multi-sensor data to detect, identify, and geo-locate emerging signals. Initiate development of a target-specific baseline to test and integrate a capability	6.446	9.846	10.238	-	10.238

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625318: *Operational Awareness Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
to assess and exploit passive, semi-active and active radio frequency identification devices and biologically motivated techniques for object detection, recognition, and tracking in video and imagery data. ***FY 2012 Base Plans:*** Complete the development and evaluation of watermarking techniques, focused on streaming media. Complete investigation of combined temporal, spatial, and frequency techniques to provide a multi-domain approach for information provenance, pedigree, and assurance. Continue the development, test, and evaluation of real time, tactical information exploitation software using laboratory tools and operational data. Develop a wide variety of exploitation methods to enhance signals situational awareness. Continue in-house and university research in advanced exploitation techniques that maximize the AF ability to gather, process, and display information from multi-INT sources identifying threats to warfighters across the physical and cyber domains. Complete the development of optimizing exploitation across sensors to enhance multi-intelligence fusion. ***FY 2012 OCO Plans:***					
Title: Major Thrust 3. ***Description:*** Develop modeling and simulation technologies for the next generation of planning, assessment, and execution environments. ***FY 2010 Accomplishments:*** Completed research to forecast actionable futures to support a decision maker's ability to appraise and plan the "best" blue course of action for rapid decide, act, and adapt. Initiated development to model and explore policy actions and reactions taken by the different modeled entities activities. Initiated development of the nation state model (to include both the physical and social subsystems) to provide an initial capability for the decision maker to understand varying degree of effects, their interactions and interdependencies caused by "blue's" potential actions. Initiated verification and validation for integration of the various frameworks. Completed investigation of ability to forecast potential adversaries and events based on indications of known evidence and projected known and/or anticipated threat(s). ***FY 2011 Plans:*** Complete development of the "core" nation state model (to include both the physical and social subsystems). Complete development to model and explore policy actions and reactions taken by the different modeled entities activities. Initiate development of tools for the analyst to identify the optimum set of leverage points to meet commander's objectives. Initiate the identification of degree to which the adversary can achieve hypothesized	4.363	2.916	1.790	-	1.790

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602788F: *Dominant Information Technology*	PROJECT 625318: *Operational Awareness Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
eCOAs based on predicted goals. Complete verification and validation for integration of the various frameworks. Initiate development of an integrated set of possible combinations of adversary COAs and adversarial intentions based on the adversary's abilities and capabilities to perform activities associated with various domains. ***FY 2012 Base Plans:*** Continue development of tools for the analyst to identify the optimum set of leverage points to meet commander's objectives. Continue the identification of degree to which the adversary can achieve hypothesized eCOAs based on predicted goals. Continue development of an integrated set of possible combinations of adversary COAs and adversarial intentions based on the adversary's abilities and capabilities to perform activities associated with various domains. ***FY 2012 OCO Plans:***					
Accomplishments/Planned Programs Subtotals	19.569	20.864	25.484	-	25.484

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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.