

UNCLASSIFIED

Exhibit R-2, PB 2010 Air Force RDT&E Budget Item Justification								DATE: May 2009		
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 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	115.278						Continuing	Continuing
625315: Connectivity and Protection Tech	0.000	0.000	44.625						Continuing	Continuing
625316: Info Mgt and Computational Tech	0.000	0.000	33.816						Continuing	Continuing
625317: Information Decision Making Tech	0.000	0.000	16.940						Continuing	Continuing
625318: Operational Awareness Tech	0.000	0.000	19.897						Continuing	Continuing
Note Note: Prior to FY 2010, efforts in this PE were performed in PE 0602702F, Command, Control and Communication.										
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 program has four projects. The Operational Awareness Tech project develops technologies that improve and automate their capability to generate process, manage, fuse, exploit, interpret, and disseminate timely and accurate information. 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 successfully deter any adversary from attacking computer systems anytime, anywhere while allowing access to, presence on, manipulation of and operational effects of adversary computer systems. In addition, this project develops the technology base for the next generation of ultra-wide-bandwidth, multi-channeled, air and space-based communications networks on and between platforms. The Info Mgmt and Computational Tech project will provide advances in robust 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 Decision Making and Response Tech project develops the technology necessary to support the commander and staff's ability to command all viable options to achieve desired effects across the full spectrum of operations. This program is in Budget Activity 2, since it develops and demonstrates the technical feasibility and military utility of evolutionary and revolutionary technologies.										

UNCLASSIFIED

R-1 Line Item #16

Page 1 of 22

UNCLASSIFIED

Exhibit R-2, PB 2010 Air Force RDT&E Budget Item Justification			DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY		R-1 ITEM NOMENCLATURE		
3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		PE 0602788F Dominant Information Technology		
B. Program Change Summary (\$ in Millions)				
	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	0.000	0.000	0.000	
Current BES/President's Budget	0.000	0.000	115.278	
Total Adjustments	0.000	0.000	0.000	
Congressional Program Reductions	0.000	0.000		
Congressional Rescissions	0.000	0.000		
Total Congressional Increases	0.000	0.000		
Total Reprogrammings	0.000	0.000		
SBIR/STTR Transfer	0.000	0.000		
Change Summary Explanation				
C. Performance Metrics				
(U) Under Development.				

UNCLASSIFIED

R-1 Line Item #16

Page 2 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification									DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology					PROJECT NUMBER 625315	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
625315: Connectivity and Protection Tech	0.000	0.000	44.625						Continuing	Continuing

Note

Note: Prior to FY 2010, efforts in this PE were performed in PE 0602702F, Command, Control and Communications, Project 4519 and Project 66SP.

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. A rapidly deployed EAF requires assured connectivity with reliable, responsive, affordable information exchange via all available communications media and across all domains - air, space, and cyber. This project provides the technologies for: secure, self-configuring, self-healing, seamless networks; advanced communications processors; anti-jam and low probability of intercept 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 the advanced fiber optic, 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 AF'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 AF commanders.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Develop assured and survivable information and networking technologies enabling worldwide command, control, surveillance, reconnaissance, and exploitation operations for the Air Force. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519.	0.000	0.000	7.013	
In FY 2008: Not Applicable.				
In FY 2009: Not Applicable.				

UNCLASSIFIED

R-1 Line Item #16

Page 3 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625315	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
In FY 2010: Initiate development of low probability of intercept, low probability of detection waveform for hand held multi data rate radio. Design smart power control and advanced field programmable gate arrays with reduced size, weight, and power for hand held multi-data rate radio. Continue development of 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.					
MAJOR THRUST: Develop improved, higher bandwidth communications and signal processing technologies to provide secure, adaptive, covert, anti-jam, and assured global battlespace connectivity to highly mobile aerospace forces, while reducing the equipment footprint. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Design and demonstrate an automated reasoning network management agent system based off of semantic web technologies capable of reasoning out suggested conclusions to detected network events rather than presenting only raw data to an information manager. Complete demonstration of assured access, anti-jam communications capability that combines multi-dimensional (space, time, frequency, coding) transmission techniques to mitigate and survive in multipath fading, interference, and jamming environments via spectrum sense and adapt techniques. Complete design and demonstration of cognitive networking technology that senses operational environment, discerns application requirements, and adapts network protocols/resources. Complete development of advanced, automated, wireless airborne networking and comm link emulation capability for the assessment and evaluation of communications algorithms in a virtual military comm environment. Initiate in-house and university development of next generation advanced networking			0.000	0.000	6.227

UNCLASSIFIED

R-1 Line Item #16

Page 4 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625315	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
technologies for distributed military operations in an airborne environment ensuring reliable information exchange across all domains of air, space, and cyber.				
MAJOR THRUST: Develop cyber defense and supporting technologies to detect, defend, and respond to attacks on friendly computer systems as well as provide forensic analysis concerning those attack attempts, and to provide cyber situational awareness to AF commanders. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Continue to develop defensive techniques for wireless, mobile, and embedded systems. Initiate vulnerability analysis and threat identification for emerging commercial wireless standards. Complete investigation of fusion of CybINT with traditional INTs and use of CybINT collection technologies to increase situation awareness of enterprise systems and malicious activities occurring therein. Continue development of technology demonstration plans for cyber situational awareness and understanding using an autonomous set of cooperative agents under positive control to defend mission critical AF assets. Initiate development of technology demonstration plans for active ISR defense on wired networks to perform an adaptive response to multiple, coordinated, and sustained attacks.	0.000	0.000	1.630	
MAJOR THRUST: Develop offensive cyber operations technologies to access, maintain presence on, and deliver effects to adversary systems. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519. In FY 2008: Not Applicable. In FY 2009: Not Applicable.	0.000	0.000	15.311	

UNCLASSIFIED

R-1 Line Item #16

Page 5 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology			PROJECT NUMBER 625315	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	
In FY 2010: Continue development of information system access methods and development of propagation techniques. Continue development of stealth and persistence technologies. Initiate development of the capability to exfiltrate information from adversary information systems for generation of actionable CybINT. Continue technology development for preparation of the battlefield and increased situational awareness and understanding. Continue development of technology to deliver D5 effects. Initiate efforts to develop autonomic technologies for operating within adversary information systems. Initiate development of techniques for covert communication among agents operating within adversary information systems. Initiate analysis of proprietary hardware and software systems to identify viable means of access and sustained operations within the same. Initiate efforts to develop a pub/sub architecture for exchange and exfiltration of information while operating within adversary information systems. Demonstrate ability to identify foreign languages as a part of a CybINT capability.					
MAJOR THRUST: Investigate the range of cyber technologies as needed to achieve information and cyber dominance. Provide development of technologies, through various methods including in-house experimentation and university research, to achieve the capability of avoiding diverse threats to blue force information systems in the cyber domain. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Initiate development of technologies to support a polymorphic cyber infrastructure that avoids exposure to threats and can proactively escape from incoming threats before they affect friendly information systems. Initiate development of techniques to support evasion and escape maneuvers in cyberspace. Initiate development of technology to provide a trusted verification of information system hardware resources. Initiate the development of remote rendering services and thin client technology to protect end user information	0.000	0.000	5.181		

UNCLASSIFIED

R-1 Line Item #16

Page 6 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology			PROJECT NUMBER 625315	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	
systems from network-delivered threats. Initiate challenge problem and university research investigations for development of cyber domain capabilities supporting AF information systems.					
MAJOR THRUST: Develop methods and technologies for controlled operation of information systems during attacks and fault conditions and technology for guaranteeing the correctness of data and executable codes. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4519. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Initiate 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. Initiate development of novel software protection techniques to guarantee the incorruptibility of data and executable codes.	0.000	0.000	2.052		
MAJOR THRUST: Develop and assess optical network technologies for application in the space environment including existing and emerging Optical CDMA and WDM modulation schemes and protocols for use in space-based optical networks. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 66SP. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Design and develop a flight test system with a Dense Wavelength Division Multiplexed (DWDM) broadcast architecture consisting of an optical backbone with single mode fiber optic cable, tunable laser transmitters, 32 channel receivers, a passive star coupler, and expanded beam connectors. Continue development of 40 channel multi wavelength optical network for on-board air and space applications.	0.000	0.000	4.839		

UNCLASSIFIED

R-1 Line Item #16

Page 7 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification							DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology				PROJECT NUMBER 625315		
B. Accomplishments/Planned Program (\$ in Millions)				FY 2008	FY 2009	FY 2010	FY 2011			
MAJOR THRUST: Develop and demonstrate heterogeneous, seamless, secure, self-configuring high capacity air/space/surface wireless networks that integrate current RF with high data rate Optical Laser communications. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 66SP. In FY 2008: Not Applicable. In FY 2008: Not Applicable. In FY 2010: Complete characterization of higher throughput RF waveform data link technology. Initiate development of prototype hardware and software with advanced coding and higher order modulation for higher throughput RF waveform generation.				0.000	0.000	2.372				
C. Other Program Funding Summary (\$ in Millions)										
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
Activity Not Provided/Not applicable	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.										

UNCLASSIFIED

R-1 Line Item #16

Page 8 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification									DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology					PROJECT NUMBER 625316	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
625316: Info Mgt and Computational Tech	0.000	0.000	33.816						Continuing	Continuing

Note

Note: Prior to FY 2010, efforts in this PE were performed in PE 0602702F, Command, Control and Communications, Projects 4519 and 5581.

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 AF 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 AF. It includes technologies in computational sciences and engineering, computer architectures and software intensive systems.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Investigate and develop technologies to securely share information via publish, subscribe, and query with coalition partners as part of the overall brokered federated Global Information Grid. Sharing of information is in part a function of secure sharing, but is also a function of the managing of the information in assessing the trustworthiness of the information and its markup. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581.	0.000	0.000	10.477	
In FY 2008: Not Applicable.				

UNCLASSIFIED

R-1 Line Item #16

Page 9 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625316	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
In FY 2009: Not Applicable. In FY 2010: Continue research into cross domain information sharing technologies. Investigate 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. Develop secure cross domain discovery and sharing of web services. Complete development of content-based dissemination mechanisms and quality of service provisioning. Initiate 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.					
MAJOR THRUST: Investigate and develop technologies to implement agile, high performance, secure, scalable, and survivable information management and dissemination services to enable a Global Information Grid-based COI Infosphere. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Develop service components that provide information management sharing mechanisms as infrastructure components within a service oriented architecture (SOA). Collections of the service components may be assembled to establish a robust and reliable information sharing substrate eliminating application complexity and management responsibility. Develop mechanisms to federate and share information across disbursed locations and establish the means to maintain provenance and authoritative control over the information. Develop information sharing mechanisms to efficiently share and synchronize dynamic information sources where information changes are in the seconds and require secure disperse dissemination. Develop prioritized queuing mechanisms to maximize value of delivered information based upon its context. Demonstrate decentralized information management through advanced infospherics research. Initiate development of tactical information dominance capabilities that include UAS, "wide-body" assets and high-altitude platforms.			0.000	0.000	13.877

UNCLASSIFIED

R-1 Line Item #16

Page 10 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625316	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
MAJOR THRUST: Develop collaborative services technologies and virtual environments to facilitate the development and fielding of next generation operational collaborative decision support systems. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Based on study results, begin 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.			0.000	0.000	0.660
MAJOR THRUST: Develop automatic and dynamically reconfigurable, affordable, scalable, distributed peta-flop processing technologies for real-time global information systems. Support need for petaflops embedded on-demand processing throughput. Develop scalable architectures to support micro to macro autonomous platforms. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Continue the development of the tools, techniques, standards, and technologies required to build highly complex software-intensive systems. Continue the development of high capacity processing on demand which will reduce the ever increasing amounts of raw data to actionable information. Provide hardware and system/support software that enables complex software to be readily composed. Evaluate current processor functionality and identify functionality necessary for system on chip capability. Initiate architectures for cognitive systems. Identify nodal design hierarchy for modular system. Initiate scalable quantum information			0.000	0.000	4.099

UNCLASSIFIED

R-1 Line Item #16

Page 11 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625316		
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010	FY 2011
science testbed for optimized information searching and processing. Develop algorithms and simulations of select computationally challenging and relevant problems. Initiate development of next generation advanced computing techniques enabling superior information processing for AF warfighters through in-house and university research.						
MAJOR THRUST: Develop secure, manageable cross domain discovery services that allow appropriate access to approved services outside of existing domain. Develop a programmable extensible architecture for pods for net-centric exploitation and tracking comprising the software and hardware infrastructure for a net-centric system to support real-time tactical collection, exploitation, and C2 suitable for employment in a UAV or targeting pod. Architecture will support reconfigurable sensor suites, self-aware networks, federated information spaces, and embedded high speed processing and archiving. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Initiate investigation of current LDAP best practices and design multi-level LDAP capability. Investigate current state of the art in web services discovery. Identify best of breed capabilities and apply security to fulfill cross-domain discovery requirements. Develop flexible sensor interfaces to support rapid sensor replacement and configuration without modification of backend hardware or software infrastructure. Evaluate impact of emerging tactical radios. Develop prioritized delivery mechanisms by integrating information management and networking complementary capabilities.			0.000	0.000	1.881	
MAJOR THRUST: Develop the architectural mechanisms that form the basis for predictable software and high assurance systems. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable.			0.000	0.000	2.822	

UNCLASSIFIED

R-1 Line Item #16

Page 12 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification							DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology				PROJECT NUMBER 625316		
B. Accomplishments/Planned Program (\$ in Millions)							FY 2008	FY 2009	FY 2010	FY 2011
In FY 2009: Not Applicable. In FY 2010: Initiate development and design of a modular trusted computing base architecture composed of the foundational hardware and software necessary to ensure overall system security. Enhance system performance of multi-core and multi-threaded microprocessors through resiliency mechanisms.										
C. Other Program Funding Summary (\$ in Millions)										
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
Activity Not Provided/Not applicable	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.										

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology					PROJECT NUMBER 625317	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
625317: Information Decision Making Tech	0.000	0.000	16.940						Continuing	Continuing

Note

Note: Prior to FY 2010, efforts in this PE were performed in PE 0602702F, Command, Control and Communications, Project 5581.

A. Mission Description and Budget Item Justification

The Air Force requires advances in technologies enabling the effective execution of military objectives 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 Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Develop next generation monitoring, planning, and assessment technologies and tools enabling distributed aerospace commanders to efficiently and collaboratively develop effects based campaigns. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Continue development of decision support sciences applications and advanced decision-making concepts for activities focused on integrated command and control (C2). Demonstrate intelligent information systems capable of supporting joint/coalition C2 associated with a specific mission in a dynamically changing environment. Continue to develop tools to increase situational awareness and understanding of the air, space, and cyberspace domains through intelligent information processing. Continue the application of system-of-systems and federation-of-systems engineering in the creation of joint/integrated C2 capabilities. Complete the exploration the application of intelligent software agents as virtual battle staff members to enhance various	0.000	0.000	3.714	

UNCLASSIFIED

R-1 Line Item #16

Page 14 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625317	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
C2 processes. Initiate investigation of intelligent software agents for autonomous AOC/platform operations. Continue 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. Develop the capability to accomplish causal reasoning, linking effects to actions to desired end-state, and capable of reasoning through uncertainty and ambiguity. Continue research to achieve the capability to analyze multiple courses of action (COA) having cascading effects in near real-time. Develop the capability 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. Initiate investigation into wargaming technologies to support the rapid analysis of crisis-action plans or courses of action. Initiate in-house and university development of next generation planning, decision making, and course of action tools supporting the commander's ability to exercise a wide range of command and execution options for AF forces.					
MAJOR THRUST: Investigate, analyze, and develop technologies for automatic rapid reconfiguration of distributed intelligent information systems to varying crisis levels faced by the Expeditionary Aerospace Force. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2009: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Continue to develop advanced interactive displays suitable for rapid deployment in harsh environments with C2 applications and command centers. Continue development of advanced techniques and AOC-based applications for information visualization for use in conjunction with multiple, heterogeneous data sets. Continue to develop technologies to improve the fidelity, accuracy, and interconnection of computer-based wargames used to prepare contingency plans and response strategies. Continue development of technologies for a holistic tool set that commanders can use to probe, study, analyze, visualize, reason, and predict activities in the battlespace. Continue development of capabilities to be more agile within a net centric enabled environment. Develop the ability for timely kinetic/non-kinetic option generation, selection, and coordination capabilities that account for uncertainty and missing and erroneous information, and supports			0.000	0.000	10.412

UNCLASSIFIED

R-1 Line Item #16

Page 15 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625317	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
intuitive decision making process between man and machine collaborating on complex, dynamic problems. Continue the development and demonstration of a decision workflow and workload management capabilities to manage the command and control constellation of resources focused on specific missions.					
MAJOR THRUST: Investigate, analyze, and develop technologies for planning, executing, and assessing seamless integrated command and control to achieve desired effects globally. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 5581. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Investigate 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 degraded conditions due to cyber attacks. Design and develop an experimentation environment and conduct scenario based integrated C2 studies. Develop and evaluate measures of effectiveness (MOEs) and measures of performance (MOPs) for key attributes associated with integrated C2. Investigate 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. Develop applications for visualizing and exploring remotely accessed heterogeneous data in to a common operating picture of the battlespace. Initiate an effort to develop an integrated task order synchronizing air, space, and cyberspace capabilities to achieve desired effect.			0.000	0.000	2.814

UNCLASSIFIED

R-1 Line Item #16

Page 16 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification								DATE: May 2009																							
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research			R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology					PROJECT NUMBER 625317																							
<u>C. Other Program Funding Summary (\$ in Millions)</u> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:15%;"></th> <th style="width:10%; text-align: center;"><u>FY 2008</u></th> <th style="width:10%; text-align: center;"><u>FY 2009</u></th> <th style="width:10%; text-align: center;"><u>FY 2010</u></th> <th style="width:10%; text-align: center;"><u>FY 2011</u></th> <th style="width:10%; text-align: center;"><u>FY 2012</u></th> <th style="width:10%; text-align: center;"><u>FY 2013</u></th> <th style="width:10%; text-align: center;"><u>FY 2014</u></th> <th style="width:10%; text-align: center;"><u>FY 2015</u></th> <th style="width:10%; text-align: center;"><u>Cost To Complete</u></th> <th style="width:10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>Activity Not Provided/Not applicable</td> <td align="center">0.000</td> <td align="center">0.000</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td align="center">Continuing</td> <td align="center">Continuing</td> </tr> </tbody> </table> <u>D. Acquisition Strategy</u> Not applicable. <u>E. Performance Metrics</u> 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.											<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>	Activity Not Provided/Not applicable	0.000	0.000							Continuing	Continuing
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>																					
Activity Not Provided/Not applicable	0.000	0.000							Continuing	Continuing																					

UNCLASSIFIED

R-1 Line Item #16

Page 17 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification									DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology					PROJECT NUMBER 625318	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
625318: Operational Awareness Tech	0.000	0.000	19.897						Continuing	Continuing

Note

Note: Prior to FY 2010, efforts in this PE were performed in PE 0602702F, Command, Control and Communications, Project 4594.

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, situation awareness, understanding, and anticipation of the threats in the battle space (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 Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Develop innovative multi-sensor collaborative fusion technologies in a fully distributed environment. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Extend and mature models to reflect real Multi-INT data effects. Demonstrate capability on real data sets. Complete Hybrid Multi-INT association algorithms based on contextual knowledge/advanced reasoning. Explore tracking techniques in combination with Multi-INT feature data to improve the probability of correct association and extend track lifetimes for moving targets. Continue to Investigate Impacts of Resource Management. Examine and demonstrate distributed multi-platform fusion utilizing resource allocation, mission	0.000	0.000	6.016	

UNCLASSIFIED

R-1 Line Item #16

Page 18 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology			PROJECT NUMBER 625318	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011	
planning, and cueing. Develop the capability to utilize detected movement information and social network analysis to define and exploit the structure and behavior of the enemy.					
MAJOR THRUST: Develop higher-level fusion and the enabling information/knowledge base technologies to achieve situational awareness and understanding at all command levels for the dynamic planning, assessment and execution processes. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2008: Not Applicable. In FY 2010: Complete development of automated reasoning techniques for assessing current situations using adversarial capabilities. Initiate development of techniques for analyzing and assessing activities to support situation assessment. Initiate 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.	0.000	0.000	1.513		
MAJOR THRUST: 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 value to the decision maker. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Continue the development and evaluation of watermarking techniques, extending to include streaming data. Extend multimedia data technologies for additional applications, with a focus on net-	0.000	0.000	3.648		

UNCLASSIFIED

R-1 Line Item #16

Page 19 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification			DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research		R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology		PROJECT NUMBER 625318	
B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010
centric technology applications. Focus on information provenance. Analyze and develop audio processing technologies in the area of vocal tract modification. Developed foundations, technology, and algorithms to enable improvements to intelligence, surveillance, and reconnaissance missions. Further provide laboratory functionality to develop real time, tactical information exploitation software for test and evaluation using operational data. Initiate the development and evaluation of algorithms to identify and classify an application layer (request/reply) messaging protocol (termed MODBUS), that provides client/server communication between devices connected on different types of buses or networks, for supervisory control and data acquisition (SCADA) systems, including field and protocol specific characteristics. Extend and incorporate these characteristics into lab-generated test sets. Initiate 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.					
MAJOR THRUST: Research and evaluate capabilities for reasoning and learning, text understanding, link and group discovery, and advanced analysis for situation awareness and understanding. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Develop and complete a framework for document level discourse analysis and inference based on information extracted from the text and ontological world knowledge. Develop and complete techniques for analysis of audio sources as well as alternate sources by applying social network analysis metrics to determine high value targets. Initiate research on dynamic networks over time for simultaneous analysis of large volumes of streaming data with archived relational information.			0.000	0.000	2.049
			0.000	0.000	6.671

UNCLASSIFIED

R-1 Line Item #16

Page 20 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification							DATE: May 2009			
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology				PROJECT NUMBER 625318		
B. Accomplishments/Planned Program (\$ in Millions)				FY 2008	FY 2009	FY 2010	FY 2011			
MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, assessment, and execution environments. Note: Prior to FY 2010, efforts were conducted in PE 0602702F, Project 4594. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Complete 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 . Initiate development to model and explore policy actions and reactions taken by the different modeled entities activities. Initiate development of the nation state model (to include both the physical and social subsystems). Provide initial capability for the decision maker to understand varying degree of effects, their interactions and interdependencies caused by "Blue's" potential actions. Initiate verification and validation for integration of the various frameworks. Investigate development of techniques that are capable of developing/managing sets of adversary futures. Complete investigation of ability to forecast potential adversaries and events based on indications of known evidence and projected known and/or anticipated threat(s). Initiate development of an integrated set of possible combinations of adversary COAs based on the adversary's abilities and capabilities to perform activities associated with various domains.										
C. Other Program Funding Summary (\$ in Millions)										
	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
Activity Not Provided/Not applicable	0.000	0.000							Continuing	Continuing
D. Acquisition Strategy										
Not applicable										

UNCLASSIFIED

R-1 Line Item #16

Page 21 of 22

UNCLASSIFIED

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602788F Dominant Information Technology	PROJECT NUMBER 625318

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.

UNCLASSIFIED

R-1 Line Item #16

Page 22 of 22