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 3: *Advanced Technology Development (ATD)*					R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*					

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	45.228	32.382	38.656	-	38.656	43.536	46.125	47.669	48.453	Continuing	Continuing
635319: *Anticipatory OPS Intent and Response*	10.252	8.031	8.744	-	8.744	9.747	8.503	7.245	7.348	Continuing	Continuing
635320: *Assured Worldwide Connectivity*	18.221	8.216	11.880	-	11.880	12.847	17.663	19.870	14.229	Continuing	Continuing
635321: *Global Battlespace Awareness*	9.534	9.318	10.502	-	10.502	10.620	13.127	13.189	16.390	Continuing	Continuing
635322: *Knowledge Management and Computing*	7.221	6.817	7.530	-	7.530	10.322	6.832	7.365	10.486	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops and demonstrates Air Force Enterprise-Centric Information technologies for the warfighter. The Global Battlespace Awareness project develops, integrates, and demonstrates advanced technologies to achieve comprehensive net-centric operations and total battlespace awareness by using and exploiting information from all sources. The Assured Worldwide Connectivity project provides advanced net-enabled architectures and communications technologies in support of global military operations, including a secure information grid for worldwide information exchange of near-real-time multimedia (i.e., voice, data, video, and imagery) information. In addition, this project develops and demonstrates advanced optical networking and communications for Air Force air- and space-based information exchange on and between platforms. These optical networks will be rapidly deployable, mobile, interoperable, and seamless between Air and Space Operations Centers (AOC) and air- and space- based platforms either en route or in theater. This project also provides the tools and applications leading to the development and integration of cyber deterrence technologies resulting in a strategic capability of cyber dominance within the secure information grid. The Knowledge Management and Computing project develops the technology applications that will provide for a secure, tailored, seamless exchange of information among producers, consumers, and managers of information relevant to a particular community of interest (COI). The project also provides the development of interactive and real-time computing technologies that greatly improve the usability of high performance computing for the exchange, utilization, and management of information in the enterprise. The Anticipatory Ops Intent and Response project develops the technologies for dynamic planning and execution with the accuracy, fidelity, and timeliness needed to dominate the battlespace. This program has been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing upgrades and/or new system developments that have military utility and address warfighter needs.

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	46.414	32.382	39.295	-	39.295
Current President's Budget	45.228	32.382	38.656	-	38.656
Total Adjustments	-1.186	-	-0.639	-	-0.639
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.186	-			
• Other Adjustments	-	-	-0.639	-	-0.639

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2010	FY 2011
Project: 635320: *Assured Worldwide Connectivity*		
Congressional Add: *Massively Parallel Optical Interconnects for Battlespace Information Exchange.*	3.983	-
Congressional Add: *Cyber Attack and Security Environment.*	2.888	-
Congressional Add Subtotals for Project: 635320	6.871	-
Congressional Add Totals for all Projects	6.871	-

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635319: *Anticipatory OPS Intent and Response*

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
635319: *Anticipatory OPS Intent and Response*	10.252	8.031	8.744	-	8.744	9.747	8.503	7.245	7.348	Continuing	Continuing

A. Mission Description and Budget Item Justification

In order to achieve information dominance, the Air Force must be able to monitor, assess, plan, and execute (MAPE) missions rapidly 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). This project develops and integrates decision support technologies that will enhance the commander's ability to anticipate and dominate the future battlespace by more effectively forecasting the evolution of the battlespace and by more rapidly generating options to "virtually checkmate" the adversary. It develops the decision aid technologies and processes to plan the use of various assets and assess their effects in the battlespace. It provides a tailorable information environment to effectively portray complex data sets accurately in real-time.

B. Accomplishments/Planned Programs ($ in Millions)

	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	1.643	1.446	1.234	-	1.234

Description: Develop and demonstrate distributed information technologies that are scalable and reconfigurable and provide seamless access to tailored multi-media and multi-spectral data.

FY 2010 Accomplishments:
Developed capabilities to allow seamless information sharing for enhanced situational awareness and understanding by the decision maker. Developed an initial capability to plan and measure effectiveness of information operations synchronized with precision munitions to determine successful achievement of command intent in time and location. Conducted campaign of experimentation to quantitatively measure transformational command and control concepts enabled by net centric warfare capabilities. Initiated an investigation of space Command and Control (C2) planning and scheduling technologies to enable enhanced space operations. Started the development of an integrated C2 tasking capability to enable seamless full spectrum options to be reasoned over and recommendations provided to the operator that will meet commander's intent. Developed capability to generate a user-defined operational picture across the air, space, and cyber domains at the strategic, operational, and tactical levels.

FY 2011 Plans:
Complete development of capabilities to allow seamless information sharing for enhanced situational awareness and understanding by the decision maker. Continue the development of an initial capability to plan and measure effectiveness of information operations synchronized with precision munitions to determine successful

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635319: *Anticipatory OPS Intent and Response*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
achievement of command intent in time and location. Continue campaign of experimentation to quantitatively measure transformational C2 concepts enabled by net centric warfare capabilities. Continue the investigation of space C2 planning and scheduling technologies to enable enhanced space operations. Continue development of an integrated C2 tasking capability to enable seamless full spectrum options to be reasoned over and recommendations provide to the operator that will meet commander's intent. Complete the development of the capability to integrate a variety of user-defined operating display technologies to visualize individual data set contexts for better situational awareness across the air, space, and cyber domains at the strategic, operational, and tactical levels. Develop and demonstrate enhanced capability to conduct space C2. *FY 2012 Base Plans:* Complete development of and demonstrate enhanced capability to conduct space C2. Complete campaign of experimentation to quantitatively measure transformational command and control concepts enabled by net centric warfare capabilities. Complete the investigation of space C2 planning and scheduling technologies to enable enhanced space operations. Complete development of an integrated C2 tasking capability to enable seamless full spectrum options to be reasoned over and recommendations provided to the operator that will meet commander's intent. *FY 2012 OCO Plans:*					
Title: Major Thrust 2. *Description:* Develop and demonstrate the integration of planning tools and information-based intelligent agents for adaptive replanning and decision support tools. *FY 2010 Accomplishments:* Developed capabilities to be more agile within a net centric enabled environment. Developed timely option generation, selection, and coordination capabilities that account for uncertainty and missing and erroneous information and supports intuitive decision making processes. Developed dynamic workflow and workload management capabilities to manage the C2 enterprise. Initiated development of a capability to assess adverse events that could potentially impact air and space mobility operations and suggest courses of action (COAs) that could be initiated to continue operations. Investigated methods to evaluate mobility COAs covering planning through assessment that anticipates multiple constraints and provides prioritized feasible recommendations that	4.229	3.007	3.345	-	3.345

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635319: *Anticipatory OPS Intent and Response*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
meets commander's intent. Developed capability to assess the impact of cyber on air and space C2 operations and suggest COAs to be initiated to continue operations in the face of cyber threats. *FY 2011 Plans:* Continue development of capabilities to be more agile within a net centric enabled environment. Continue development of timely option generation selection and coordination capabilities that account for uncertainty and missing and erroneous information, and supports intuitive decision making processes. Continue to develop dynamic workflow and workload management capabilities to manage the C2 enterprise. Complete development of a capability to assess adverse events that could potentially impact air and space mobility operations and suggest COAs that could be initiated to continue operations. Continue the investigation of methods to evaluate mobility COAs covering planning through assessment that anticipates multiple constraints and provides prioritized feasible recommendations that meets commander's intent. Continue development of capability to assess the impact of cyber on air and space C2 operations and suggest COAs to be initiated to continue operations in the face of cyber threats. *FY 2012 Base Plans:* Complete the investigation of methods to evaluate mobility COAs covering planning through assessment that anticipates multiple constraints and provides prioritized feasible recommendations that meets commander's intent. Initiate development of net-centric mission planning and execution capabilities to support master space plan and joint space task order production and a net enabled dynamic decision support capability for a variety of air and space missions. *FY 2012 OCO Plans:*					
Title: Major Thrust 3. *Description:* Develop and demonstrate an effects-based approach for the next generation of planning and assessment techniques that enable decision makers to determine operational effects. *FY 2010 Accomplishments:* Developed and demonstrated real-time information technologies that enable a decision maker to comprehend his or her current situational awareness by assessing an operation's progress against desired effects (reflective) and identifying key indicators and observables to assist in anticipating future success or failure of a campaign (predictive). Investigated the methods to enable a decision support environment that enables the decision maker to anticipate and shape all aspects of the future battlespace. Developed predictive battlespace planning	4.380	3.578	4.165	-	4.165

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*	**PROJECT** 635319: *Anticipatory OPS Intent and Response*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
tools with the ability to reason over models of the "enemy as a system." Evaluated competing approaches for the analysis of cascading effects in real-time for diverse courses of action. Initiated design of a tool suite for rapidly wargaming proposed actions against an intelligent adversary. Developed and demonstrated capability to enable integrated traditional and cyber effects based assessment for air and space operations centers. Developed capability to integrate kinetic and non-kinetic assets in an integrated tasking order to achieve desired commander's effects. *FY 2011 Plans:* Continue the development and demonstration of real-time information technologies that enable a decision maker to comprehend their current situational awareness by assessing an operation's progress against desired effects (reflective) and identifying key indicators and observables to assist in anticipating future success or failure of a campaign (predictive). Complete investigating and evaluating methods to enable a decision support environment that enables the decision maker to anticipate and shape all aspects of the future battlespace. Continue development of predictive battlespace planning tools with the ability to reason over models of the "enemy as a system." Demonstrate a suite of interacting tools/services that assist analysts in estimating the cascading effects of proposed actions in near-real-time for diverse COAs. *FY 2012 Base Plans:* Integrate and test decision support environment, within service oriented architectures, that enables the decision maker to anticipate and shape all aspects of the future battlespace. Complete development of predictive battlespace planning tools with the ability to reason over models of the "enemy as a system." Conduct simulation experiments to analyze courses of action and evaluate capabilities across multiple domains. Design and conduct limited technology experiments to investigate the technical and operational challenges associated with integrated air, space, and cyber C2 within and across multiple service oriented architectures. Continue the development and demonstration of real-time information technologies that enable a decision maker to comprehend their current situational awareness by assessing an operation's progress against desired effects (reflective) and identifying key indicators and observables to assist in anticipating future success or failure of a campaign (predictive). Initiate integration of cascading courses of action reasoners. Initiate development of a toolset for predictive assessment, developing insight into action, causal mechanisms, and their effects. *FY 2012 OCO Plans:*					
Accomplishments/Planned Programs Subtotals	10.252	8.031	8.744	-	8.744

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*	**PROJECT** 635319: *Anticipatory OPS Intent and Response*

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635320: *Assured Worldwide Connectivity*

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
635320: *Assured Worldwide Connectivity*	18.221	8.216	11.880	-	11.880	12.847	17.663	19.870	14.229	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires advanced net-enabled architectures and communications technologies in support of global kinetic and non-kinetic military operations including a secure information grid for worldwide information delivery and exchange of near-real-time information including voice, data, video, and imagery. This secure environment will be rapidly deployable, mobile, interoperable, and seamless between Air and Space Operations Centers (AOC) and aircraft, either en route or in theater. This project provides secure information transmission capabilities for a persistent, global, survivable communications backbone network accessible for warfighters operating in all domains; it provides self-healing, self-configuration, anti-jam communication networking capabilities; and it provides enterprise networking capabilities for agile, policy-based network management. In addition, this project develops and demonstrates advanced optical networking and communications for Air Force air- and space-based information exchange on and between platforms including development of highly integrated multi-gigabit optical and radio frequency networks, all optical data routers, optical backbone interface circuits for on board information exchange, and integrated electronic, adaptive optic systems for atmospheric mitigation. The Air Force also requires the ability to deliver sovereign options in cyberspace through the development and integration of cyber attack, cyber defense, and cyber support technologies for a strategic capability of cyber dominance. This project develops the ability to deliver: 1) cyber attack capabilities: access, stealth and persistence, cyber intelligence, and weapons delivery, 2) cyber defense capabilities: attack detection, attack attribution, and response automation, and 3) cyber support capability: situational awareness and war gaming.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1.	1.383	0.313	-	-	-
Description: Develop and demonstrate secure wideband assured networking between weapon platforms, ground facilities, and Special Operations teams. *FY 2010 Accomplishments:* Developed a small form-factor networking and reachback capability. Initiated design and demonstration of soldier interface, performed initial flight test. *FY 2011 Plans:* Complete development of small form-factor networking and reachback capability. *FY 2012 Base Plans:* *FY 2012 OCO Plans:*					
Title: Major Thrust 2.	4.142	3.333	5.185	-	5.185

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635320: *Assured Worldwide Connectivity*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total

Description: Proactively defend cyberspace through cyber situational awareness, detecting, and defeating cyber threats, and surviving through adaptation and self-generation.

FY 2010 Accomplishments:
Demonstrated a fleet of 1,000 cooperative, positively controlled, trusted agents that can defend mission critical information system assets and collect actionable cyber intelligence (CybINT) for cyber situation awareness. Conducted assured end-to-end Quality of Service (QoS) and Quality of Assurance (QoA) integration to the information system enterprise during malicious and non-malicious faults. Developed capability to geo-locate red, blue, and non-combatant internet protocol (IP) addresses and devices globally and locally to achieve better situational awareness to efficiently position cyber defenses. Initiated development of a complete situational awareness capability of cyber network assets, both red and blue forces, to include both virtual and physical cyber assets.

FY 2011 Plans:
Continue development of a comprehensive situational awareness and understanding capability of cyber network assets, both red and blue forces, to include both virtual and physical cyber assets. Continue assured end-to-end QoA and QoA integration to the information system enterprise during malicious and non-malicious faults. Develop capability to automatically discover large-scale network topologies to enhance cyber situation assessment and map the discovered topologies to mission essential functions. Initiate the development of technologies that provides knowledge of the adversary to strengthen the quality of threat assessments. Initiate the development of a cross-domain voice-over-IP (VOIP) capability to enhance the utility of voice transmissions within a mobile tactical environment. Develop cyber testbed capability for in-house investigations of cyber defense policies and offensive cyber techniques with the ability to conform to command intent for cyber indications and warning and rules of engagement.

FY 2012 Base Plans:
Complete development of capability to automatically discover large-scale network topologies to enhance cyber situation assessment and map the discovered topologies to mission essential functions. Complete the development of technologies that provides knowledge of the adversary to strengthen the quality of threat assessments. Initiate development of capability to integrate indications and warnings and observables into situation awareness and impact assessment capabilities. Continue assured end-to-end QoA and QoA integration to the information system enterprise during malicious and non-malicious faults.

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 3: *Advanced Technology Development (ATD)*				**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*		**PROJECT** 635320: *Assured Worldwide Connectivity*	

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Title: Major Thrust 3. ***Description:*** Develop and demonstrate offensive cyber operations capabilities in a series of Experimental Cyber Craft technology demonstrations. ***FY 2010 Accomplishments:*** Analyzed development of additional offensive cyber operations capabilities, integrated kinetic and cyber operations planning and execution capabilities, and cyber command and control (Cyber C2) operations functions. Completed selected offensive cyber capabilities to access, remain stealthy, gather intelligence, and affect adversary information and information systems. Finalized technology demonstration plans. ***FY 2011 Plans:*** Continue to analyze development of additional offensive cyber operations capabilities, integrated kinetic and cyber operations planning and execution capabilities, and Cyber C2 operations functions. ***FY 2012 Base Plans:*** Conduct experiments using testbed capability for in-house investigations of cyber defense policies and offensive cyber techniques to gain a better understanding of how an adversary might attack Air Force systems. Continue to analyze development of additional offensive cyber operations capabilities, integrated kinetic and cyber operations planning and execution capabilities, and Cyber C2 operations functions. ***FY 2012 OCO Plans:***	3.221	2.492	0.806	-	0.806
Title: Major Thrust 4. ***Description:*** Develop and demonstrate intelligent networking transport and management technology to provide assured, seamless, battlespace connectivity to the Air Force. ***FY 2010 Accomplishments:*** Initiated advanced demonstration of high capacity assured access (anti-jam) communications for global spectrum dominance. Developed QoS-enabled information management and dissemination combined with network policy language for efficient, prioritized information exchange. ***FY 2011 Plans:*** Continue to develop advanced demonstration of high capacity assured access (anti-jam) communications for global spectrum dominance. Continue development of QoS-enabled information management and dissemination combined with network policy language for efficient, prioritized	0.223	0.828	2.730	-	2.730

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
information exchange in airborne networks. ***FY 2012 Base Plans:*** Initiate development of cognitive radio technology that will enable mission specific adaptive optimization of communications links responsive to current conditions, situations, and priorities as each mission is executed. Initiate advanced demonstration of end-to-end QoS and QoA performance for various application-dependent network configuration, management, and implementation scenarios. ***FY 2012 OCO Plans:***					
Title: Major Thrust 5. ***Description:*** Integrate and demonstrate a resilient and self-regenerating information enterprise that dynamically recognizes, characterizes, and understands novel cyber attacks and reconfigures and self-optimizes to resist new attacks. ***FY 2010 Accomplishments:*** Began integration of technologies to introduce synthetic diversity into friendly information systems. Initiated integration of anti-tamper software protection technology with enterprise information systems. ***FY 2011 Plans:*** Continue integration technologies to recognize, characterize, and understand attacks and anomalies, aid in the creation of synthetically diverse, functionally equivalent software, and continuously monitor, reconfigure, and self-optimize. ***FY 2012 Base Plans:*** Continue integration technologies to recognize, characterize, and understand attacks and anomalies, aid in the creation of synthetically diverse, functionally equivalent software, and continuously monitor, reconfigure, and self-optimize. Initiate developing techniques for guaranteeing the execution of critical processes during system recovery and data reconstitution. ***FY 2012 OCO Plans:***	1.136	0.574	2.126	-	2.126
Title: Major Thrust 6. ***Description:*** Integrate technology to demonstrate an effects-based strategic approach to cyber defense that focuses on avoiding, deferring, and minimizing the threat, and rendering the adversary ineffective.	-	0.676	1.033	-	1.033

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635320: *Assured Worldwide Connectivity*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
FY 2010 Accomplishments:					
FY 2011 Plans: Develop technologies to simulate a diverse set of active machines to thwart an adversary by transferring the attack to specialized nodes for analysis. Initiate development of capability to automatically generate secure system/network configuration based on policy, architectural specifications, and operational requirements.					
FY 2012 Base Plans: Continue to develop technologies to simulate a diverse set of active machines to thwart an adversary by transferring the attack to specialized nodes for analysis. Continue development of capability to automatically generate secure system/network configuration based on policy, architectural specifications, and operational requirements.					
FY 2012 OCO Plans:					
Title: Major Thrust 7. *Description:* Develop and demonstrate flight ready systems consisting of high capacity radio frequency (RF) and optical components and architectures for next generation communications. *FY 2010 Accomplishments:* Completed the design of higher throughput RF waveform data link for operation under adverse weather conditions. Began fabrication of several flight test ready RF waveform data link systems. *FY 2011 Plans:* *FY 2012 Base Plans:* *FY 2012 OCO Plans:*	1.245	-	-	-	-
Accomplishments/Planned Programs Subtotals	11.350	8.216	11.880	-	11.880

	FY 2010	FY 2011
Congressional Add: Massively Parallel Optical Interconnects for Battlespace Information Exchange.	3.983	-

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*	**PROJECT** 635320: *Assured Worldwide Connectivity*

	FY 2010	FY 2011
FY 2010 Accomplishments: Conducted Congressionally-directed effort.		
FY 2011 Plans:		
Congressional Add: Cyber Attack and Security Environment.	2.888	-
FY 2010 Accomplishments: Conducted Congressionally-directed effort.		
FY 2011 Plans:		
Congressional Adds Subtotals	6.871	-

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 3: *Advanced Technology Development (ATD)* | | | R-1 ITEM NOMENCLATURE
PE 0603788F: *Global Information Dev/Demo* | | | | PROJECT
635321: *Global Battlespace Awareness* | | | |

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
635321: *Global Battlespace Awareness*	9.534	9.318	10.502	-	10.502	10.620	13.127	13.189	16.390	Continuing	Continuing

A. Mission Description and Budget Item Justification

In order to achieve information dominance, the Air Force must be able to monitor, assess, plan, and execute (MAPE) missions rapidly 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). This project develops, integrates, and demonstrates advanced technologies to achieve comprehensive net-centric operations and Predictive Battlespace Awareness using information from all sources. Technology development includes: tasking information collectors (intelligence, surveillance, and reconnaissance platforms, national intelligence sources, etc.); correlating and geo-registering the collected data; exploiting the data to extract information of military significance; fusing information from multiple sources to create a digital-n-dimensional representation of the battlespace; assessing the situation; predicting adversary courses of action (COA); and archiving the results for ready use by decision makers. This is a dynamic, complex process that involves technologies for information exploitation, fusion, processing, storage, and retrieval, as well as technologies for machine reasoning, pattern recognition, and timeline analysis.

B. Accomplishments/Planned Programs ($ in Millions)

	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1. *Description:* Demonstrate advanced signal and data exploitation technologies for detection, tracking, identification, and targeting of time-critical targets, and information extraction. *FY 2010 Accomplishments:* Completed Space Situational Awareness (SSA) research in multi-sensor exploitation tools for adversary satellite characterization and in integrated intelligence analysis products to produce anticipatory ground to space awareness picture and initiate SSA research in the development of a set of algorithms that can both automatically track space objects and detect changes in satellite images. Initiated the application of developed watermarking technologies, including audio, to development programs of record, targeting intelligence applications by providing information assurance and provenance to the data through the development of proper protocols. *FY 2011 Plans:* Develop methodologies and processing of collecting intelligence data from a collection of ever present stand-in multi-sensor ad-hoc networks. Continue SSA research in the development of a set of algorithms that can both automatically track space objects and complete demonstration of algorithms to detect changes in satellite images. Continue development to enhance signal processing techniques to fit into existing Intelligence,	3.966	3.278	2.745	-	2.745

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*	**PROJECT** 635321: *Global Battlespace Awareness*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Surveillance, and Reconnaissance (ISR) infrastructures. Continue integration of developed watermarking techniques and protocols for information assurance, provenance and pedigree leading to the integration of watermarking technologies into network-centric programs of record, and initiate development of novel steganalysis methods for identifying and disrupting embedded information. *FY 2012 Base Plans:* Complete development to enhance signal processing techniques to fit into existing ISR infrastructures. Complete the development of a set of algorithms that can automatically track space objects in support of SSA. Continue both the integration of developed watermarking techniques and protocols for information assurance, provenance and pedigree leading to the integration of watermarking technologies into network-centric programs of record, and the development of novel steganalysis methods for identifying and disrupting embedded information. *FY 2012 OCO Plans:*					
Title: Major Thrust 2. *Description:* Developed and demonstrated advanced data handling, event visualization technologies, and distributed data fusion to enable a more effective utilization of data available. *FY 2010 Accomplishments:* Completed evaluation and support toolsets for advanced fusion algorithms and provide community accepted measures of performance across all efforts. Initiated development to mature and integrate models for adversarial behavior and provide support for situation analysis utilizing a service oriented architecture. Developed the capability to integrate a variety of user definable display technologies to visualize individual data set contexts for better situational awareness. *FY 2011 Plans:* Continue development to mature and integrate models for adversarial behavior and provide support for situation analysis utilizing a service oriented architecture. Develop and demonstrate the capability to conduct distributed fusion to enhance situational awareness of the battlespace Initiate development of algorithmic tools and techniques to analyze and exploit recorded signals intelligence data across multiple missions, to provide the capability for forensic analysis of single or multi-platform data across multiple missions for increased situational awareness and intelligence. *FY 2012 Base Plans:*	1.100	1.193	2.034	-	2.034

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Continue development to mature and integrate models for adversarial behavior and provide support for situation analysis utilizing a service oriented architecture. Continue development of algorithmic tools and techniques to analyze and exploit recorded signals intelligence data across multiple missions, to provide the capability for forensic analysis of single or multi-platform data across multiple missions for increased situational awareness and intelligence. *FY 2012 OCO Plans:*					
Title: Major Thrust 3. *Description:* Develop and demonstrate capabilities for reasoning and learning, text understanding, link and group discovery, and advanced analysis for situational awareness and understanding. *FY 2010 Accomplishments:* Initiated development of a text extraction capability that enables users to fine-tune the extractor, based on their specialized knowledge of the domain, to achieve higher performance. Initiated development of tools and services for advanced behavioral modeling techniques and advanced capabilities for analysis that integrate situation understanding, situation monitoring, and event anticipation. Initiated the development of a set of algorithms that can automatically develop, reason, dynamically update various sub-sets of the existing intelligence preparation of the battlespace products (e.g., named areas, target areas, COA, units, infrastructure areas, lines of communication). Conducted research and demonstrate the performance gains with active distributed sensing and processing and identify the limitations for further research. Initiated development to enhance signal processing techniques to fit into existing ISR infrastructures. *FY 2011 Plans:* Continue development of a text extraction capability that enables users to fine-tune the extractor, based on their specialized knowledge of the domain, to achieve higher performance. Continue development of tools and services for advanced behavioral modeling techniques and advanced capabilities for analysis that integrate situation understanding, situation monitoring, and event anticipation. Initiate development of dynamic social network analysis methods to provide the analyst with the ability to identify high value targets in social networks and anticipate their role and activity. Continue development of a set of algorithms that can automatically develop, reason, dynamically update various sub-sets of the existing intelligence preparation of the battlespace	2.372	2.877	3.076	-	3.076

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
products, and initiate development of techniques for analyzing and assessing activities to support situation assessment. ***FY 2012 Base Plans:*** Complete development of a text extraction capability that enables users to fine-tune the extractor, based on their specialized knowledge of the domain, to achieve higher performance. Complete development of tools and services for advanced behavioral modeling techniques and advanced capabilities for analysis that integrate situation understanding, situation monitoring, and event anticipation. Initiate exploring general purpose bridges between the corpus of electronic text and formal reasoning systems. Continue development of dynamic social network analysis methods to provide the analyst with the ability to identify high value targets in social networks and anticipate their role and activity. Complete development of a set of algorithms that can automatically develop, reason, dynamically update various sub-sets of the existing intelligence preparation of the battlespace products, and continue development of techniques for analyzing and assessing activities to support situation assessment. ***FY 2012 OCO Plans:***					
Title: Major Thrust 4. ***Description:*** Develop models to provide detailed understanding of the adversary's probable intent and future strategy to identify adversary COAs, the most likely COA, and the COA most dangerous to friendly forces and mission accomplishment. ***FY 2010 Accomplishments:*** Continue research to forecast actionable futures to support a decision maker's ability to appraise and plan the "best" blue COA for Rapid, Decide, Act and Adapt (RDAA). Continue investigation of ability to forecast potential adversaries and events based on indications of known evidence and projected known and/or anticipated threats. Initiate investigation in the capability to manage multiple possible future adversary COAs prioritized based on current and future (projected) impact/threat. Initiate investigation in developing screening techniques that give the analyst/decision maker insight into the contribution or sensitivity of various factors on a given observable/response. ***FY 2011 Plans:*** Complete research to forecast actionable futures to support a decision maker's ability to appraise and plan the "best" blue course of action for RDAA. Complete investigation of ability to forecast potential adversaries and	2.096	1.970	2.647	-	2.647

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
events based on indications of known evidence and projected known and/or anticipated threat(s). Continue investigating the capability to manage multiple possible future adversary COAs prioritized based on current and future (projected) impact/threat. Continue investigation in developing screening techniques that give the analyst/decision maker insight into the contribution or sensitivity of various factors on a given observable/response, initiate investigation of techniques that will allow model adaptation to new regions and nations, and start development of a functional graphical user environment to support output analysis. Initiate capability to model and explore policy actions and reactions taken by the different modeled entities. Initiate development and demonstrate of robust support applications to enhance multi-intelligence collection requirements. *FY 2012 Base Plans:* Continue development of a functional graphical user environment to support output analysis and complete investigations in developing screening techniques that give the analyst/decision maker insight into the contribution or sensitivity of various factors on a given observable/response and use scenarios and conduct user testing and feedback of models for new regions and nations. Complete investigation of the capability to manage multiple possible future adversary COAs prioritized based on current and future (projected) impact/threat. Continue developing capability to model and explore policy actions and reactions taken by the different modeled entities, and start developing the capability to allow users to perform automated generation, assessment, and visualization of traces from model results to key underlying causes. Continue to develop and demonstrate robust support applications to enhance multi-intelligence collection requirements. *FY 2012 OCO Plans:*					
Accomplishments/Planned Programs Subtotals	9.534	9.318	10.502	-	10.502

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

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603788F: *Global Information Dev/Demo*	**PROJECT** 635321: *Global Battlespace Awareness*

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603788F: *Global Information Dev/Demo*	PROJECT 635322: *Knowledge Management and Computing*

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
635322: *Knowledge Management and Computing*	7.221	6.817	7.530	-	7.530	10.322	6.832	7.365	10.486	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires technologies that will provide the decision maker and staff with seamless access to tailored information within a mobile, dynamic, and scalable, globally distributed Air and Space Operations Center (AOC), as well as among other producers, consumers, and managers of information relevant to other particular communities of interest (COI). This project demonstrates the enterprise management capabilities needed for the rapid distribution of actionable information, as well as the needed advances in high performance computing to ensure this complex capability. This project develops an agile information environment that focuses on quality of service, transformation and brokering, a federated information environment focusing the relationship among the members of the environment, a secure cross-domain information sharing capability that focuses on the security layer and inter-COI information exchange in different security domains, and a collaboration environment focusing on the information workflow layer of the enterprise. This project will also develop: 1) a computational science and engineering capability demonstrating new models of computation; 2) novel approaches for high performance, interactive, net-centric, distributed, and embedded computing systems; and 3) the technological tools enabling affordable, large-scale, complex, 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. *Description:* Develop and demonstrate computer architectures with greater capacity and sophistication to enable game changing computing power to the warfighter, anywhere, anytime. *FY 2010 Accomplishments:* Initiated development of petaflops embedded on-demand computing to evaluate options for on-board processing of common sensor algorithms and real-time high performance plug-and-play computing services to enhance space situational awareness. Initiated development of a stacked chip architecture for cognitive and autonomous systems. Completed development of a rapid reaction identifying and optimizing codes demonstrating at least 100x improvement through the techniques applied. Initiated predictable software testing tools to ease the complexity, understanding, and managing software in software-intensive systems. Initiated architecture and development of trusted router hardware based upon a hardware root of trust. *FY 2011 Plans:* Continue the development of petaflops embedded on-demand computing and complete demonstration of real-time high performance computing services to enhance space situational awareness and complete enhancement of firmware and software for existing high performance computer boards for plug-and play-satellite. Complete	2.394	2.865	3.247	-	3.247

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B. Accomplishments/Planned Programs ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
development and demonstration of stacked chip architecture for cognitive and autonomous systems. Develop and demonstrate high-payoff, high performance computing applications to reduce size, weight, and power restrictions. Complete development of predictable software testing tools to ease the complexity, understanding, and managing software in software-intensive systems. Initiate development of comprehensive software and hardware solutions for parallel discrete event simulation on emerging multi-core architectures. Complete development and prototype demonstration of trusted router hardware based upon a hardware root of trust. *FY 2012 Base Plans:* Continue the development of petaflops embedded on-demand computing, and demonstrate achieved performance and functionality. Initiate development of architectures for a compact large array of many node clusters with very low power demand for intelligent systems. Initiate development and demonstration of an autocode generation capability for software intensive systems. Complete development of comprehensive software and hardware solutions for parallel discrete event simulation on emerging multi-core architectures. *FY 2012 OCO Plans:*					
Title: Major Thrust 2. *Description:* Demonstrate how a publish, subscribe, and query information management paradigm can enable vertical and horizontal integration of Air Force information systems. *FY 2010 Accomplishments:* Completed development of a common security labeling methodology that promotes the automatic flow of time-sensitive information among different security domains. Completed development of approaches for applying secure information sharing concepts to mobile ad-hoc networks which are often characterized by low-bandwidth and intermittent connectivity. Initiated development of a method to securely link data and metadata. Initiated development of an adaptive security policy expression and enforcement mechanism for automated information review and release among different security domains. Initiated development and perform field demonstrations of cross domain sharing mechanisms in an operational setting to support a prototype installation command system. *FY 2011 Plans:* Continue to develop secure, accreditable cross domain information sharing techniques in an operational setting and develop a scalable integrated environment where information is easily and securely shared across multiple secure domains while preventing accidental or intentional information disclosure. Continue development of an	1.242	1.086	0.761	-	0.761

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
adaptive security policy expression and enforcement mechanism for automated information review and release among different security domains. Complete development of a method to securely link data and metadata. *FY 2012 Base Plans:* Complete development of an adaptive security policy expression and enforcement mechanism for automated information review and release among different security domains. Complete developments of secure, accreditable cross domain information sharing techniques in an operational setting and of a scalable integrated environment where information is easily and securely shared across multiple secure domains while preventing accidental or intentional information disclosure Initiate development of attack resistant cross domain services. *FY 2012 OCO Plans:*					
Title: Major Thrust 3. *Description:* Demonstrate how agile information management services enable effective information sharing in a tactical environment. *FY 2010 Accomplishments:* Completed demonstration of pub/sub/query mechanisms for tactical airborne platforms. Initiated development of tactical information management pub/sub/query mechanisms focusing on stability, performance, and reliability for assured access and isolation from malicious client applications, and assured levels of QoS. Completed the development of the capability to integrate a variety of common operating display technologies to visualize individual data set contexts for better situational awareness across the air, space, and cyber domains at the strategic, operational, and tactical levels. Completed demonstrations of various elements of core information management (IM) services to include context aware IM services, quality of service enabled dissemination, service oriented IM, and advanced IM system services. *FY 2011 Plans:* Continue development of tactical information management pub/sub/query mechanisms focusing on stability, performance, and reliability for assured access and isolation from malicious client applications, and assured levels of QoS. Initiate investigating and quantifying the network burden and quality of service requirements for service oriented architecture implementations across a variety of tactical environments. Initiate development of survivable IM services that are highly adaptive and self-aware across the variety of IM architectures. *FY 2012 Base Plans:*	3.585	2.866	3.522	-	3.522

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B. Accomplishments/Planned Programs ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Continue development of tactical information management pub/sub/query mechanisms focusing on stability, performance, and reliability for assured access and isolation from malicious client applications, and assured levels of QoS. Initiate design and development of a mission oriented, highly adaptive and self-aware unified intelligent capability to provide observable, actionable insights and visibility across information management services and their deployed platforms from inside-out and provide survivability-aware information sharing capabilities to anticipate achieving the information level mission goals under any conditions. Continue investigating and quantifying the network burden and quality of service requirements for service oriented architecture implementations across a variety of tactical environments. Continue development of survivable IM services that are highly adaptive and self-aware across the variety of IM architectures. *FY 2012 OCO Plans:*					
Accomplishments/Planned Programs Subtotals	7.221	6.817	7.530	-	7.530

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.