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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 3 - Advanced Technology Development (ATD)	R-1 ITEM NOMENCLATURE PE 0603456F Human Effectiveness Adv Tech Dev
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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	24.565						Continuing	Continuing
635323: Directed Energy Bioeffects Parameters	0.000	0.000	1.703						Continuing	Continuing
635324: Human Dynamics and Terrain Demonstration	0.000	0.000	6.259						Continuing	Continuing
635325: Mission Effective Performance	0.000	0.000	4.703						Continuing	Continuing
635326: Performance Enhancement Demonstration	0.000	0.000	4.556						Continuing	Continuing
635327: Warfighter Interfaces	0.000	0.000	7.344						Continuing	Continuing

Note
 Note: In FY 2010, Directed Energy Bioeffects Parameters efforts will move from PE 0603231F, Project 5020 to PE 0603456F, Project 5323; Human Dynamics and Terrain Demonstration efforts will move from PE 0603231F, Project 2830 to PE 0603456F, Project 5324; Mission Effective Performance efforts will move from PE 0603231F, Project 4924 to PE 0603456F, Project 5325; Performance Enhancement Demonstration efforts will move from PE 0603231F, Project 2830 and Project 5020 to PE 0603456F, Project 5326; and Warfighter Interfaces efforts will move from PE 0603231F, Project 2830 to PE 0603456F, Project 5327 to better align efforts.

A. Mission Description and Budget Item Justification
 This program develops and demonstrates technologies to enhance human performance and effectiveness in the aerospace force. State-of-the-science advances are made in warfighter training, warfighter system interfaces, directed energy bioeffects, deployment and sustainment of warfighters in extreme environments, and understanding and shaping adversarial behavior. The Mission Effective Performance project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. The Warfighter Interfaces project develops, demonstrates, and transitions technologies to revolutionize the way human operators synergistically use Air Force systems, including autonomous machines and adaptive teams of humans and machines. The Directed Energy Bioeffects Parameters project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. The Performance Enhancement Demonstration project develops, demonstrates, and transitions technologies to increase survivability and performance of personnel

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during military operations. The Human Dynamics and Terrain Demonstration project develops, demonstrates, and transitions technologies to anticipate and influence adversarial behavior within the air, space, and cyber domains. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies to protect and enhance the performance of Air Force personnel in operational environments.

B. Program Change Summary (\$ in Millions)

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>
Previous President's Budget	0.000	0.000	0.000	
Current BES/President's Budget	0.000	0.000	24.565	
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

Not Applicable.

C. Performance Metrics
Under Development.

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APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603456F Human Effectiveness Adv Tech Dev					PROJECT NUMBER 635323	
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
635323: Directed Energy Bioeffects Parameters	0.000	0.000	1.703						Continuing	Continuing

Note

Note: In FY 2010, Directed Energy Bioeffects Parameters efforts will move from PE 0603231F, Project 5020 to PE 0603456F, Project 5323 to better align efforts.

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. This project also develops the human-components of the guidelines for testing, deployment, and protection from high power microwave and high-energy laser systems and uses this information to enhance the effectiveness of these weapon systems in air, space, and cyber operations. The optical radiation bioeffects research develops and demonstrates technologies that counter optical threats, while exploiting optical systems for non-lethal applications. Radio frequency radiation (RFR) bioeffects research develops, demonstrates, and transitions technologies to the warfighters. Biobehavioral systems efforts focus on the design and characterization of scalable non-lethal directed energy and novel effects weapons, including quantification of physiological and psychological effectiveness and risks associated with these weapons.

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

	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Develop and demonstrate protective technologies for aircrew and ground personnel to provide protection against directed energy threats. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Complete validation and verification of human systems integration tool for directed energy protective equipment (optical radiation only). Continue assessment of radio frequency radiation personnel protection technologies. Begin monitoring optical radiation skin protection technologies.	0.000	0.000	0.816	
	0.000	0.000	0.887	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop and demonstrate technologies to assess bioeffects and collateral hazards from directed energy systems.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Combine angular-dependent and individual/crowd behavior models as function of directed energy parameters. Integrate target effects across directed energy spectrum into collateral damage tool development. Conduct field validation studies of model predictions. Develop conceptual design for mission planning tools.</p>				

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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>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602202F/ Human Effectiveness Applied Research.	0.000	0.000							Continuing	Continuing
PE 0603231F/ Crew Systems and Personnel Protection Technology.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	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.										

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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
635324: Human Dynamics and Terrain Demonstration	0.000	0.000	6.259						Continuing	Continuing

Note

Note: In FY 2010, Human Dynamics and Terrain Demonstration efforts will move from PE 0603231F, Project 2830 to PE 0603456F, Project 5324 to better align efforts.

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions technologies to anticipate and influence adversarial behavior within the air, space, and cyber domains. These technologies will enhance Air Force capabilities in intelligence, surveillance, and reconnaissance (ISR), layered sensing, decision aids for computer network attack/defense/support, cyber force development and training, anticipatory command, control, and intelligence (C2I), measures of effectiveness for psychological operations, cross-cultural communication, and human-centric exploitation of measurement and signatures intelligence.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop, mature, and demonstrate technology to provide mission-essential capabilities for AF cyber operator performance enhancement. Demonstrate and transition human-centric decision-support tools and models for increased cyber operator situational awareness. Demonstrate quantitative measures of effectiveness for candidate cyber operator improvement capabilities.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop technologies to enhance cyber operator situational awareness capabilities. Develop advanced cyber mission/campaign planning tools that optimize blue force readiness and operational effectiveness. Develop, integrate, and assess advanced cyber mission/campaign planning tools that facilitate the operator's ability to anticipate and influence an adversary's behavior.</p>	0.000	0.000	2.197	
	0.000	0.000	0.994	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: The ISR technology portfolio is focused on human-centered design processes and operational tools that optimize information flows between ISR analysts, assessors, collection managers, and warfighters operating in a distributed collaborative, multi-source mission planning environment. Enhance current and planned network-centric and effects-based operations with advanced technology tools that produce faster, more effective ISR information for decision makers.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop and demonstrate automated tools and techniques designed to decrease an intelligence analyst's data overload condition and improve productivity. Concentrate technology development in the areas of ISR processes, ISR mission planning, and tool integration utilizing net-centric automated services to increase ISR enterprise capabilities, effectiveness, and quality, while reducing complexity, cost, and intelligence production cycle times. Demonstrate and transition technologies for ISR dynamic planning, geospatial intelligence tools, and multi-INT information operations tools used in AF ISR weapons systems. Develop and assess the effectiveness of anticipatory approaches to enhance command, control, and intelligence.</p>				
<p>MAJOR THRUST: Develop and demonstrate anticipatory C2I decision-aiding technologies that assist the Joint Forces Commander (JFC)/Joint Forces Air Component Commander (JFACC) to rapidly assess the battlefield situation, predict the most likely adversary behaviors, and select and prioritize the appropriate courses of action.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p>	0.000	0.000	1.105	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY 2010: Integrate decision-aiding tools into identified technology demonstration programs. Evaluate the methodologies developed to quantifiably measure the effectiveness of the commander's predictive environment decision aids and simulation tools. Refine tools with emphasis on intelligence analysis and the anticipation elements. Evaluate the expanded operational benefits and utility of the decision aid tools and simulation in field exercises.				
<p>MAJOR THRUST: Identify, integrate, demonstrate, and transition technology that optimizes human operator performance within AF influence operations. Refine techniques to anticipate and influence an adversary's behavior. Demonstrate adversarial modeling techniques used to gauge adversarial intent and probabilities/methods of attack. Develop and mature automated foreign speech translation tools to aid AF information/influence operations warfighters. Develop models demonstrating quantitative measures of effectiveness of advanced influence operations capabilities.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Identify, integrate, demonstrate, and transition technology that optimizes human operator performance within AF influence operations. Illustrate adversarial cultural modeling techniques used to gauge adversarial threats. Mature and transition research into influence operations human performance training effectiveness, mission rehearsal, simulations, and combat readiness. Mature quantitative measures of effectiveness for psychological operations (PSYOP) and selected influence operations capabilities. Develop and demonstrate next-generation information operations and cyber influence capabilities yielding non-kinetic warfighting options. Demonstrate and transition advanced speech-to-speech translation tools which support automated, cross-cultural communications.</p>	0.000	0.000	1.963	

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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>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602202F/ Human Effectiveness Applied Research.	0.000	0.000							Continuing	Continuing
PE 0603231F/ Crew Systems and Personnel Protection Technology.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	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.

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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
635325: Mission Effective Performance	0.000	0.000	4.703						Continuing	Continuing

Note

Note: In FY 2010, Mission Effective Performance efforts will move from PE 0603231F, Project 4924 to PE 0603456F, Project 5325 to better align efforts.

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. This project also develops advanced methods and technologies to enable interactive live, virtual, and constructive (LVC) environments for performance-aiding methods and technologies. Activities include development of computer-generated entities to support training, simulation, and mission rehearsal; integrated high-fidelity weapon-systems training technologies for air, space, and cyber; tailored immersive simulation environments for Airmen at the tactical and operational levels; robust performance assessment and feedback tools; and maturation of game-based technologies for effective and efficient training. These methods and technologies facilitate the development of mission-essential competencies.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Advance aerospace and organizational behavior models for integrated warfighter training and rehearsal. These computer-generated models will add realistic operations, command and control, force protection, and air base defense warfighters. Technologies will increase training effectiveness and efficiency, and decrease time-to-mission qualification.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Evaluate and validate learning and mission performance impacts associated with common tools for mission planning, briefing, and after action review. Identify specific methods and tools of relevance within and across mission contexts and levels of decision making (e.g., tactical, operational, and strategic). Validate immersive training alternative environments for coalition training for close air support and air-to-ground coordination. Conduct schoolhouse and field training, rehearsal, and exercise evaluations and demonstrations</p>	0.000	0.000	2.349	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
in LVC contexts for close air support and command and control. Demonstrate integration of distributed air and space operations center (AOC) teams with tactical LVC operations for kill-chain training and operations. Field deployable distributed mission operations (DMO) training exemplars and conduct mission impact evaluations on their integration into routine operations training events. Complete development for deployable trainers and mission planning and after action review toolsets and update field deployed systems for further evaluation and training assessment.				
<p>MAJOR THRUST: Develop and demonstrate a high-fidelity DMO training and rehearsal capability for operators in an AOC. Link AOC operational mission requirements and performance metrics to develop team learning environments for AOC units. Develop and demonstrate high-fidelity, interactive electronic warfare (EW) training technologies for use with LVC training networks for future threat systems/capabilities and advanced sensor platforms and weapons systems. These technologies provide AF and coalition warfighters with more realistic EW mission training and rehearsal environments that accurately represent 21st century threats, thereby increasing operational readiness and capability.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop the integrated strategy and plans division trainer based on competency-based training requirements and optimum mission rehearsal strategies. Develop individual interfaces between component simulations and AOC equipment systems. Begin to code, integrate, and test the execution management capabilities for the simulation set. Begin development of a DMO and C2ISR common database generation system and live EW range integration into DMO. Demonstrate an on-range live fly of LVC EW training with live emitters/platforms.</p>	0.000	0.000	2.354	

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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>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602202F/ Human Effectiveness Applied Research.	0.000	0.000							Continuing	Continuing
PE 0603231F/ Crew Systems and Personnel Protection Technology.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	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.										

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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
635326: Performance Enhancement Demonstration	0.000	0.000	4.556						Continuing	Continuing

Note

Note: In FY 2010, Performance Enhancement Demonstration efforts will move from PE 0603231F, Project 2830 and Project 5020 to PE 0603456F, Project 5326 to better align efforts.

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions technologies to increase survivability and performance of personnel during military operations. Bioscience efforts develop advanced biotechnology, nanotechnology, and neuroscience solutions for the protection and enhanced effectiveness of battlefield airmen. Counterproliferation efforts develop biotechnology and bio-tagchants to advance the ability to detect, identify, monitor, and neutralize biological threat agents. The counterproliferation effort also demonstrates and transitions modeling and simulation techniques for operational assessment of pre- and post-bio-agent attack. Biobehavioral and biomechanics focus areas develop aircrew support technologies that enhance warfighter protection and improve performance during long-duration missions. The biomechanics focus area also develops technology to rapidly integrate multi-sensor data with automated dynamic human modeling to anticipate and identify human adversarial threats.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: In the counterproliferation area, develop and demonstrate novel, tailored bio-tagchant and identification/neutralization capabilities to meet specific AF needs to enhance force protection and enable air operations commanders to maintain operations tempo.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Optimize the selected bio-tagchant technologies and begin the development of platforms to employ the bio-tagchants. Optimize the insertion/distribution of bio-tagchants in target areas. Evaluate tagchant technologies in simulated operational environments. Initiate research to develop capabilities to track biological warfare agents inside buildings and vehicles.</p>	0.000	0.000	1.709	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop and demonstrate technologies for improved force protection, maintenance of peak warfighter performance in known toxic environments, and identification of difficult-to-detect enemy threats. Develop technologies to rapidly integrate multi-sensor data with automated dynamic human modeling to anticipate, find, fix, track, and identify human threats. Develop model-based threat awareness, visualization, and risk assessment technologies that include human adversarial intent.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop methods to identify key human threat indicators to reduce bandwidth requirements and enable real-time threat assessment from the air. Develop enhanced anthropometric visualization techniques that integrate heterogeneous sensor data of potential adversaries.</p>	0.000	0.000	2.847	

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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>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602202F/ Human Effectiveness Applied Research.	0.000	0.000							Continuing	Continuing
PE 0603231F/ Crew Systems and Personnel Protection Technology.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	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.										

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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
635327: Warfighter Interfaces	0.000	0.000	7.344						Continuing	Continuing

Note

Note: In FY 2010, Warfighter Interfaces efforts will move from PE 0603231F, Project 2830 to PE 0603456F, Project 5327 to better align efforts.

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions technologies to revolutionize the way human operators optimize the capabilities of Air Force systems, including autonomous machines and adaptive teams of humans and machines. Improvements in the presentation of operational information to the community of users, from the system operator to the commander, must be developed in step with advancements in the acquisition, storage, and retrieval of information. This project provides the advances in understanding of human cognitive abilities, as well as the utilization of human interfaces, multi-sensory fusion, high-resolution image displays, and three-dimensional audio to customize communications and enhance shared understanding across a diverse user community in air, space, and cyber for maximum situational awareness.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop and demonstrate technologies in a collaborative interface infrastructure to facilitate team building, sensemaking, and workflow in a globally distributed, net-centric command and control (C2) environment. Technologies address uncertainty, sharing difficulty, temporal arrangement, and integrated work coupling to ensure that C2 warfighters can effectively collaborate in distributed operations as a net-enabled "teamspace."</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Analyze the hardware and software trade-space options for a future C2 collaborative interface environment. Begin concept development of sensemaking technologies and collaborative decision support tools for the resulting net-centric C2 environment infrastructure.</p>	0.000	0.000	0.910	

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APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)	R-1 ITEM NOMENCLATURE PE 0603456F Human Effectiveness Adv Tech Dev		PROJECT NUMBER 635327	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop and demonstrate technologies to interface between ground-based combat controllers and multiple machine components through unified visual and auditory displays for battlefield airmen. Technologies address ground controller-specific requirements leading to faster mission execution timelines, reduced targeting and fratricide errors, and increased situational awareness through positional awareness of friend and foe in combat zones.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop integrated multisensory interfaces for ground-based combat controllers. Develop and demonstrate advanced cabling and wireless technologies to improve operator mobility, decrease system setup time, and reduce the probability of user errors or system malfunctions. Demonstrate integrated human-centered concepts for enhanced portability, maintainability, and usability. Refine audio and visual interfaces to enhance operator survivability, improve communication effectiveness, and allow effective use of wearable computers without impairing the mobility of dismounted combat controllers.</p>	0.000	0.000	2.720	
<p>MAJOR THRUST: Develop and demonstrate supervisory-level interfaces between ground controllers and multiple, highly autonomous unmanned aerial systems (UAS). Employ real-time wargaming simulations and field tests to quantify the decision-making benefits from advanced control/display portrayal concepts that optimize net-centric information flow to system operators.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Develop warfighter interface control station technologies permitting the effective conduct of cooperative dynamic reconnaissance, surveillance, and target acquisition missions either by a single warfighter</p>	0.000	0.000	1.392	

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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 3 - Advanced Technology Development (ATD)	R-1 ITEM NOMENCLATURE PE 0603456F Human Effectiveness Adv Tech Dev		PROJECT NUMBER 635327	
B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>or by a two-person crew in the next-generation supervisory control station. Integrate advanced mission and sensor management controls, displays, and decision aids with multi-UAS cooperative control automation for demonstration of the next-generation supervisory control station. Begin to demonstrate and assess system performance and mission effectiveness in high-fidelity virtual simulation and flight test environments.</p>				
<p>MAJOR THRUST: Develop and demonstrate advanced job performance aiding technologies, emphasizing human interaction with complex planning algorithms. Job-aiding technologies will provide planners with automated access to a manageable amount of multi-source information, minimize information overload, and support faster and more accurate decision-making. These technologies will allow the planners and automation to develop and optimize a set of plans and best course of action. Note: In FY 2010, this effort is broken out from the first major thrust to separate distinct technology areas.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Begin to develop a visual interface concept that planners may use to visualize the primary constraints within capacity-based planning. Include alternative planning algorithms that exploit cognitive engineering and work-centered design principles. Outline a program plan featuring interactive simulations as a way to optimize resource allocation in complex time-sensitive deployments.</p>	0.000	0.000	0.500	
<p>MAJOR THRUST: Develop and demonstrate cognitive-based analytic and design methods and computer software tools for C2 operations to synchronize personnel in distributed locations with a shared understanding of the C2 battlespace. Increasingly, C2 personnel operate in a complex information environment that inhibits situation understanding and complicates operational decision-making. This decision support technology exploits an emerging work-centered user interface concept having the potential to rapidly configure common visualizations of C2 operations and streamline decision-making.</p>	0.000	0.000	1.822	

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B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010	FY 2011					
<p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Begin analysis and refine analytic methods and techniques to support unified action for large, cross-organizational C2 teams and teams-of-teams. Begin concept development of an extensible work-aiding framework that integrates future and current work aids into a coherently unified framework that affords efficient and effective action of large distributed and semi-independent teams and individuals.</p>											
C. Other Program Funding Summary (\$ in Millions)											
	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost	
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing	
PE 0602202F/ Human Effectiveness Applied Research.	0.000	0.000							Continuing	Continuing	
PE 0603231F/ Crew Systems and Personnel Protection Technology.	0.000	0.000							Continuing	Continuing	
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	0.000	0.000							Continuing	Continuing	
D. Acquisition Strategy											
Not Applicable.											

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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.