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Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force									DATE: February 2010		
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							
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	0.000	27.390	24.814	0.000	24.814	27.874	28.774	30.291	31.812	Continuing	Continuing
635323: Directed Energy Bioeffects Parameters	0.000	1.696	2.270	0.000	2.270	2.520	2.459	2.545	2.643	Continuing	Continuing
635324: Human Dynamics and Terrain Demonstration	0.000	6.233	6.426	0.000	6.426	6.745	6.711	8.897	9.720	Continuing	Continuing
635325: Mission Effective Performance	0.000	4.683	4.530	0.000	4.530	5.676	5.935	5.142	5.392	Continuing	Continuing
635326: Performance Enhancement Demonstration	0.000	7.465	4.377	0.000	4.377	4.572	4.546	4.704	4.941	Continuing	Continuing
635327: Warfighter Interfaces	0.000	7.313	7.211	0.000	7.211	8.361	9.123	9.003	9.116	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 during military operations. The Human Dynamics and Terrain Demonstration project develops, demonstrates, and transitions technologies to anticipate and influence											

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APPROPRIATION/BUDGET ACTIVITY		R-1 ITEM NOMENCLATURE			
3600: Research, Development, Test & Evaluation, Air Force		PE 0603456F: Human Effectiveness Adv Tech Dev			
BA 3: Advanced Technology Development (ATD)					
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)					
	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	0.000	24.565	0.000	0.000	0.000
Current President's Budget	0.000	27.390	24.814	0.000	24.814
Total Adjustments	0.000	2.825	24.814	0.000	24.814
• Congressional General Reductions		0.000			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.115			
• Congressional Adds		2.940			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	24.814	0.000	24.814
Congressional Add Details (\$ in Millions, and Includes General Reductions)					
Project: 635326: Performance Enhancement Demonstration				FY 2009	FY 2010
Congressional Add: Water for Injection and Air Purification with Carbon Nanotube Nanostructured Materials.				0.000	2.928
Congressional Add Subtotals for Project: 635326				0.000	2.928
Congressional Add Totals for all Projects				0.000	2.928
Change Summary Explanation					
The FY 2010 President's Budget submittal did not reflect FY 2011 through FY 2015 funding. A detailed explanation of changes between the two budget positions is not provided because it cannot be made in a relevant manner.					
In FY 2010, Congress added \$2.94 million for Water for Injection and Air Purification with Carbon Nanotube Nanostructured Materials.					
C. Performance Metrics					

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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	
Under Development.		

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force								DATE: February 2010			
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603456F: <i>Human Effectiveness Adv Tech Dev</i>				PROJECT 635323: <i>Directed Energy Bioeffects Parameters</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635323: <i>Directed Energy Bioeffects Parameters</i>	0.000	1.696	2.270	0.000	2.270	2.520	2.459	2.545	2.643	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 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 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	
MAJOR THRUST: Develop and demonstrate protective technologies for aircrew and ground personnel to provide protection against directed energy threats. <i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable. <i>FY 2010 Plans:</i> 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	0.813	0.770	0.000	0.770	

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Begin incorporating validated human systems integration tools and techniques into vulnerability models. Continue monitoring optical radiation skin protection material technologies and radio frequency radiation personnel protection technologies. Initiate research into advanced modeling and simulation of the bioeffects of high energy directed energy weapon systems.						
FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop and demonstrate technologies to assess bioeffects and collateral hazards from directed energy systems.		0.000	0.883	1.500	0.000	1.500
FY 2009 Accomplishments: In FY 2009: Not Applicable.						
FY 2010 Plans: 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.						
FY 2011 Base Plans: In FY 2011: Perform field and laboratory experiments to verify and validate collateral hazard assessment software models on high energy laser systems and evaluate next generation of directed energy hazard assessment tools. Initiate software development to incorporate directed energy human effects from collateral hazard predictions into war-gaming scenarios. Increase computational speed of collateral hazard predictions for near real-time modules for weapon system fire control and mission planning applications.						

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B. Accomplishments/Planned Program (\$ in Millions)											
						FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	
FY 2011 OCO Plans: In FY 2011 OCO: N/A											
Accomplishments/Planned Programs Subtotals						0.000	1.696	2.270	0.000	2.270	
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: <i>Human Effectiveness Applied Research.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603231F: <i>Crew Systems and Personnel Protection Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635324: <i>Human Dynamics and Terrain Demonstration</i>	0.000	6.233	6.426	0.000	6.426	6.745	6.711	8.897	9.720	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 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop, mature, and demonstrate technology to provide mission-essential capabilities for AF cyber operator performance enhancement and situational awareness. <i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable. <i>FY 2010 Plans:</i> 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.							0.000	2.188	2.365	0.000	2.365

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Develop technologies to increase cyber operator situational awareness capabilities. Evaluate suitability of technologies to transition cyber operator tools that integrate advanced influence operations technologies designed to anticipate and influence an adversary's behavior. Identify, integrate, demonstrate, and evaluate readiness for transition of technologies that increase human performance within cyber domain operations.						
FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate human-centered design processes and operational tools that optimize ISR information flows in a distributed, multi-source mission planning environment.		0.000	0.990	1.045	0.000	1.045
FY 2009 Accomplishments: In FY 2009: Not Applicable.						
FY 2010 Plans: 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.						
FY 2011 Base Plans: In FY 2011: Develop and demonstrate advanced ISR analyst productivity tools. Demonstrate, validate, and transition human-centric decision-aids, tools, and process improvements in integrated,						

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
computer-based ISR system tools and related techniques supporting ISR weapons systems with an emphasis on anticipatory approaches to enhance command, control, and intelligence. Develop, mature, assess, and transition tools designed to increase ISR productivity by focusing on the interactions between humans and their automated planning and assessment tools. FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate anticipatory C2I decision-aiding technologies to rapidly assess battlefield situation, predict likely adversary behaviors, and select/prioritize courses of action. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: 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. FY 2011 Base Plans: In FY 2011: Evaluate the suitability, maturity, and readiness of demonstrated decision-aiding technologies for transition to JFC/JFACC component users. Incorporate final improvements into end-products. FY 2011 OCO Plans: In FY 2011 OCO: N/A		0.000	1.100	0.495	0.000	0.495
		0.000	1.955	2.521	0.000	2.521

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop/demonstrate technology to optimize human operator performance, adversarial modeling techniques, and automated speech translation tools to aid AF information/influence operations. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: 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 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. FY 2011 Base Plans: In FY 2011: Demonstrate and determine the suitability, maturity, and readiness of next-generation information operations and cyber influence capabilities which yield non-kinetic warfighting options. Demonstrate and assess the effectiveness of advanced adversarial cultural modeling techniques used to gauge adversarial threats and behavior signatures. Develop, demonstrate, and assess the suitability of technology to transition advanced speech-to-speech translation tools that support automated, cross-cultural communications. Validate and improve models used to demonstrate measures of effectiveness for selected AF influence operations capabilities. FY 2011 OCO Plans: In FY 2011 OCO: N/A						
Accomplishments/Planned Programs Subtotals		0.000	6.233	6.426	0.000	6.426

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C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: Human Effectiveness Applied Research.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603231F: Crew Systems and Personnel Protection Technology.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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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APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603456F: <i>Human Effectiveness Adv Tech Dev</i>				PROJECT 635325: <i>Mission Effective Performance</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635325: <i>Mission Effective Performance</i>	0.000	4.683	4.530	0.000	4.530	5.676	5.935	5.142	5.392	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 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Advance aerospace/organizational behavior models for integrated warfighter training and rehearsal. Add realistic operations, command and control, force protection, and air base defense. <i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable. <i>FY 2010 Plans:</i> 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	0.000	2.339	1.753	0.000	1.753

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
training for close air support and air-to-ground coordination. Conduct schoolhouse and field training, rehearsal, and exercise evaluations and demonstrations 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.						
FY 2011 Base Plans: In FY 2011: Complete field deployment and evaluation of embedded performance measurement and reporting system for combat mission readiness. Develop preliminary functionality for a learning management system for distributed mission operations and LVC training, rehearsal, and exercise. Develop and evaluate an integrated environment for learning and assessment that includes live, virtual, and constructive air operations center planners, ground command and control, close air support aircraft, terminal attack and control personnel, and air combat assets. Complete development and field assessment of tailored training inside the ready aircrew program allocation of sorties and mission types for at least three mission areas and operational systems. Develop specifications for interface and data control approaches for managing learning in LVC contexts.						
FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate high-fidelity DMO training/rehearsal capability for AOC operators and electronic warfare (EW) training technologies for future threat systems/capabilities.		0.000	2.344	2.777	0.000	2.777
FY 2009 Accomplishments: In FY 2009: Not Applicable.						

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: 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.					
FY 2011 Base Plans: In FY 2011: Develop code, integrate, and test the execution management capabilities for the simulation set. Develop, integrate, and test the performance assessment capability within the simulation set. Develop scenario authoring tools and integrate with simulation components. Test and integrate the entire strategy and plans division trainer and begin integration with the AOC part task trainer. Develop vendor-specific real-time database examples from the database generation system's outputs. Begin development of methodologies for real-time incorporation of data into DMO, homeland security, and C4ISR databases. Demonstrate a multi-ship/onboard networked LVC EW training concept. Conduct an integrated, on board EW training demonstration with live aircraft and with a major test/training range.					
FY 2011 OCO Plans: In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	0.000	4.683	4.530	0.000	4.530

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C. Other Program Funding Summary (\$ in Millions)											
			FY 2011	FY 2011	FY 2011						
Line Item	FY 2009	FY 2010	Base	OCO	Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: <i>Human Effectiveness Applied Research.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603231F: <i>Crew Systems and Personnel Protection Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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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APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603456F: <i>Human Effectiveness Adv Tech Dev</i>				PROJECT 635326: <i>Performance Enhancement Demonstration</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635326: <i>Performance Enhancement Demonstration</i>	0.000	7.465	4.377	0.000	4.377	4.572	4.546	4.704	4.941	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-tagants 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 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop/demonstrate tailored bio-taggant and identification/neutralization capabilities to enhance force protection/enable air operations commanders to maintain operations tempo.	0.000	1.702	1.925	0.000	1.925
<i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.					
<i>FY 2010 Plans:</i> In FY 2010: Optimize the selected bio-taggant technologies and begin the development of platforms to employ the bio-tagants. Optimize the insertion/distribution of bio-tagants in target areas.					

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Evaluate taggant technologies in simulated operational environments. Initiate research to develop capabilities to track biological warfare agents inside buildings and vehicles. FY 2011 Base Plans: In FY 2011: Complete the development of the rapid, hand-held bio-taggant threat identification platforms and transition to the warfighter. Conduct research to develop capabilities to track biological warfare agents inside buildings and vehicles. FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate technologies for improved force protection, maintenance of peak performance in known toxic environments, and identification of difficult-to-detect enemy threats. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: 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. FY 2011 Base Plans: In FY 2011: Demonstrate a human morphable digital model that adapts to different sensor input and predicts both threat and the combination of sensing systems needed to increase the precision of predictions. Demonstrate new human threat awareness, visualization, and risk assessment capabilities for the deployed Airmen. Develop techniques to analyze behavioral data and apply the information to relevant AF missions.		0.000	2.835	2.452	0.000	2.452

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B. Accomplishments/Planned Program (\$ in Millions)											
							FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 OCO Plans: In FY 2011 OCO: N/A											
Accomplishments/Planned Programs Subtotals							0.000	4.537	4.377	0.000	4.377
							FY 2009	FY 2010			
Congressional Add: Water for Injection and Air Purification with Carbon Nanotube Nanostructured Materials. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Water for Injection and Air Purification with Carbon Nanotube Nanostructured Materials.							0.000	2.928			
Congressional Adds Subtotals							0.000	2.928			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: Human Effectiveness Applied Research.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u> <u>Base</u>	<u>FY 2011</u> <u>OCO</u>	<u>FY 2011</u> <u>Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
<ul style="list-style-type: none"> • PE 0603231F: <i>Crew Systems and Personnel Protection Technology.</i> 											
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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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force								DATE: February 2010			
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603456F: <i>Human Effectiveness Adv Tech Dev</i>				PROJECT 635327: <i>Warfighter Interfaces</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635327: <i>Warfighter Interfaces</i>	0.000	7.313	7.211	0.000	7.211	8.361	9.123	9.003	9.116	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 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop/demonstrate technologies in a collaborative interface infrastructure to facilitate team building, sensemaking, and workflow in a globally distributed, net-centric C2 environment. <i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable. <i>FY 2010 Plans:</i> 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.							0.000	0.906	1.550	0.000	1.550

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Develop flexible and modular proof-of-concept interface tools used for team formation, intense collaboration, sensemaking, distributed decision support, and workflow. These tools will be used by C2 collaborators under cyber fight-through conditions and when conducting cyber-supported mission assurance activities. Begin to integrate and test functionality of the modular distributed tools for demonstration in various C2 team decision making environments. Initiate technology demonstrations in representative users' cyber environments.						
FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate technologies to interface between ground-based combat controllers and multiple machine components through unified visual and auditory displays for battlefield Airmen.		0.000	2.709	1.500	0.000	1.500
FY 2009 Accomplishments: In FY 2009: Not Applicable.						
FY 2010 Plans: 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.						

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p><i>FY 2011 Base Plans:</i> In FY 2011: Complete final evaluations of integrated components. Demonstrate the integrated system concept, including advanced audio, speech, and visual interfaces, improved human-centric software applications, wearable power management systems, and ergonomically improved cabling and carriage concepts. Conduct laboratory evaluations to assess effectiveness of integrated system and compare performance to original baseline. Conduct field evaluations of technology components and prepare for transition to operational capability.</p> <p><i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A</p>					
<p>MAJOR THRUST: Develop/demonstrate supervisory-level interfaces between ground controllers and multiple, highly autonomous UAS that optimize net-centric information flow to system operators.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.</p> <p><i>FY 2010 Plans:</i> 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 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><i>FY 2011 Base Plans:</i> In FY 2011: Complete the development of advanced multi-UAS control station technology for dynamic reconnaissance, surveillance, and time-critical target acquisition missions. Complete the integration of</p>	0.000	1.386	1.458	0.000	1.458

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
cooperative engagement algorithms and operator interface technologies for technology demonstration. Complete the demonstration and assessment of system performance and mission effectiveness enabled by the next-generation supervisory control station, using high-fidelity virtual simulation and flight test environments. Determine how many vehicles a UAS operator can effectively manage/supervise. FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop and demonstrate advanced job performance aiding technologies, emphasizing human interaction with complex planning algorithms. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: 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. FY 2011 Base Plans: In FY 2011: Develop visual interface and incorporate advanced algorithms for planning military mobility operations. Demonstrate the ability to exploit automated planning to optimize the use of resources within Joint Deployment and Distribution Enterprise capacity constraints. Provide for real-time operator interaction within the capacity-based planner and begin to quantify the benefits of the human-automation interaction relative to current capabilities.		0.000	0.498	1.112	0.000	1.112

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 OCO Plans: In FY 2011 OCO: N/A						
MAJOR THRUST: Develop/demonstrate cognitive-based analytic/design methods and computer software tools for C2 operations to synchronize personnel in distributed locations. FY 2009 Accomplishments: In FY 2009: Not Applicable. FY 2010 Plans: 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. FY 2011 Base Plans: In FY 2011: Demonstrate and evaluate a unifying C2 work-aiding framework supporting distributed cross-organizational teams and individuals, including integration of a representative set of existing tools. Examine results and refine work-centered analytic, design, and development methods and techniques as applied to teams. FY 2011 OCO Plans: In FY 2011 OCO: N/A		0.000	1.814	1.591	0.000	1.591
Accomplishments/Planned Programs Subtotals		0.000	7.313	7.211	0.000	7.211

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C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: <i>Human Effectiveness Applied Research.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603231F: <i>Crew Systems and Personnel Protection Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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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