Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force										DATE: February 2012	
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 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	23.445	25.283	21.523	-	21.523	17.088	18.406	16.758	16.007	Continuing	Continuing
635323: *Directed Energy Bioeffects Parameters*	2.332	2.286	1.040	-	1.040	0.837	1.153	1.000	0.971	Continuing	Continuing
635324: *Human Dynamics and Terrain Demonstration*	5.981	6.117	9.988	-	9.988	8.640	9.339	9.192	8.710	Continuing	Continuing
635325: *Mission Effective Performance*	4.038	5.149	3.925	-	3.925	2.336	2.685	1.994	2.006	Continuing	Continuing
635326: *Performance Enhancement Demonstration*	4.103	4.147	-	-	-	-	-	-	-	Continuing	Continuing
635327: *Warfighter Interfaces*	6.991	7.584	6.570	-	6.570	5.275	5.229	4.572	4.320	Continuing	Continuing

Note

In FY 2013, Project 635326, Performance Enhancement Demonstration, moves to Project 635324, Human Dynamics and Terrain Demonstration, 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 human-centric technologies to address processing, exploitation, and dissemination of intelligence, surveillance, and reconnaissance (ISR) capability needs. Efforts in this program have 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 to protect and enhance the performance of Air Force personnel in operational environments.

Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force		DATE: February 2012
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*	

B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	24.814	25.319	26.218	-	26.218
Current President's Budget	23.445	25.283	21.523	-	21.523
Total Adjustments	-1.369	-0.036	-4.695	-	-4.695
• Congressional General Reductions	-	-0.036			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.744	-			
• SBIR/STTR Transfer	-0.481	-			
• Other Adjustments	-0.144	-	-4.695	-	-4.695

Change Summary Explanation

FY11: Other Adjustments include -0.144 Congressional General Reductions

Decrease in FY13 is due to higher Department of Defense priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
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 635323: *Directed Energy Bioeffects Parameters*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635323: *Directed Energy Bioeffects Parameters*	2.332	2.286	1.040	-	1.040	0.837	1.153	1.000	0.971	Continuing	Continuing

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 (RF) 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 Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	0.796	0.819	0.820	-	0.820
Description: Develop and demonstrate optical protective technologies for aircrew and ground personnel to provide protection against directed energy threats. Develop modeling capabilities to assess collateral hazards from high power directed energy laser systems.					
FY 2011 Accomplishments: Incorporated validated human systems integration tools and techniques into vulnerability models. Continued monitoring optical radiation skin protection material technologies and RF radiation personnel protection technologies. Initiated research into advanced modeling and simulation of the bioeffects of high energy directed energy weapon systems. Continued research into advanced modeling and simulation software to predict target and collateral effects of high energy directed energy systems.					
FY 2012 Plans: Test end-to-end laser eye protection (LEP) design capability by merging frame and format design capability with a visual performance metrics and modeling capability to create a single, integrated package allowing complete human systems integration of LEP. Validate microwave modeling and simulation tool. Develop software to incorporate RF energy-induced human effects from collateral hazard predictions into war-gaming scenarios.					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635323: *Directed Energy Bioeffects Parameters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Increase computational speed of collateral hazard predictions for near-real-time modules for weapon system fire control and mission planning applications. ***FY 2013 Base Plans:*** Integrate and test physics-based modeling techniques for advanced laser eye protection in next generation cockpit scenarios for human systems integration and protection. Integrate laser bioeffects models and collateral effects algorithms into high-fidelity predictions of High Energy Laser weapons effects to enable safe testing of weapons effects and demonstrator concepts. Benchmark collateral hazard prediction algorithms for lasers. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 2 ***Description:*** Develop and demonstrate technologies to assess RF bioeffects and collateral hazards from high power RF directed energy systems. ***FY 2011 Accomplishments:*** Performed 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. Initiated software development to incorporate directed energy human effects from collateral hazard predictions into war-gaming scenarios. Increased computational speed of collateral hazard predictions for near- real-time modules for weapon system fire control and mission planning applications. ***FY 2012 Plans:*** Continue testing and validation of high energy laser collateral effects real-time predictive models for directed energy weapon systems. Continue integration of directed energy hazard assessment tools in war-gaming scenarios. Test and validate near-real-time modules for weapon system fire control and mission planning applications. ***FY 2013 Base Plans:*** Demonstrate validated microwave modeling and simulation tools to non-lethal RF weapon wargames for realistic human effects. ***FY 2013 OCO Plans:*** N/A	1.536	1.467	0.220	-	0.220
Accomplishments/Planned Programs Subtotals	2.332	2.286	1.040	-	1.040

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635323: *Directed Energy Bioeffects Parameters*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	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 2013 Air Force			DATE: February 2012
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 635324: *Human Dynamics and Terrain Demonstration*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635324: *Human Dynamics and Terrain Demonstration*	5.981	6.117	9.988	-	9.988	8.640	9.339	9.192	8.710	Continuing	Continuing

Note

Note: In FY 2013, Major Thrust 2 from Project 635326 moves into this project to better align efforts.

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	2.214	0.253	-	-	-
Description: Develop, mature, and demonstrate technology to provide mission-essential capabilities for Air Force cyber operator performance enhancement and situational awareness. ***FY 2011 Accomplishments:*** Developed technologies to increase cyber operator situational awareness capabilities. Evaluated suitability of technologies to transition cyber operator tools that integrate advanced influence operations technologies designed to anticipate and influence an adversary's behavior. Identified, integrated, demonstrated, and evaluated readiness for transition of technologies that increase human performance within cyber domain operations. ***FY 2012 Plans:*** Continue cyber situational awareness integration technologies and develop technologies to enhance human performance in the cyber performance area. ***FY 2013 Base Plans:*** N/A Note: This effort ends in FY 2012 due to higher Air Force priorities. ***FY 2013 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635324: *Human Dynamics and Terrain Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 2	1.442	4.287	3.144	-	3.144
Description: Develop/demonstrate human-centered design processes and operational tools that optimize ISR information flows in a distributed, multi-source mission planning environment. Develop/demonstrate anticipatory C2I decision-aiding technologies to rapidly assess battlefield behaviors, and select/prioritize courses of action. Develop/demonstrate anticipatory C2I decision-aiding technologies to rapidly assess battlefield situation, predict likely adversary behaviors, and select/prioritize courses of action. ***FY 2011 Accomplishments:*** Developed and demonstrated advanced ISR analyst productivity tools. Demonstrated, validated, and transitioned human-centric decision-aids, tools, and process improvements in integrated, computer-based ISR system tools and related techniques supporting ISR weapon systems with an emphasis on anticipatory approaches to enhance C2I. Developed, matured, assessed, and transitioned tools designed to increase ISR productivity by focusing on the interactions between humans and their automated planning and assessment tools. Evaluated the suitability, maturity, and readiness of demonstrated decision-aiding technologies for transition to component users. Incorporated final improvements into end-products. ***FY 2012 Plans:*** Deliver software prototype of unified analytical tool kit and work environment to support increased analyst speed and more robust, inclusive decision-making with lower cognitive overhead. Deliver prototype human-inspired cueing system to speed image analysis. Develop and test new methods to support visualization and manipulation of large, abstract data sets through combining recent advanced in neuroscience and neuroimaging techniques with neural-based feature extraction and data filtering. Build in-house prototype to rapidly and effectively detect and correlate relationships withpatterns of life and anomalous threat detection and identification. ***FY 2013 Base Plans:*** Develop an analyst testbed concept for evaluating effectiveness of analyst tool integration in the processing, exploitation, and dissemination process. Develop work aids for intel analysts and tools for collabrative syntheses and social cogitive analysis. ***FY 2013 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635324: *Human Dynamics and Terrain Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 3 ***Description:*** Develop/demonstrate technology to optimize human operator performance, adversarial modeling techniques, and automated speech translation tools to aid Air Force information/influence operations. ***FY 2011 Accomplishments:*** Demonstrated and determined the suitability, maturity, and readiness of next-generation information operations and cyber influence capabilities which yield non-kinetic warfighting options. Demonstrated and assessed the effectiveness of advanced adversarial cultural modeling techniques used to gauge adversarial threats and behavior signatures. Developed, demonstrated, and assessed the suitability of technology to transition advanced speech-to-speech translation tools that support automated, cross-cultural communications. Validated and improved models used to demonstrate measures of effectiveness for selected Air Force influence operations capabilities. ***FY 2012 Plans:*** Develop advanced techniques to rapidly develop and easily maintain speech-to-speech translation systems in multiple languages and application domains with limited data availability. ***FY 2013 Base Plans:*** Continue research and development on tools, algorithms, and techniques for development of domain specific automatic speech recognition (ASR), machine translation (MT), and natural language processing (NLP) components in new languages and domains, especially those characterized by minimal data availability. ***FY 2013 OCO Plans:*** N/A	2.325	1.577	2.500	-	2.500
Title: Major Thrust 4 ***Description:*** Apply human threat signatures to inform sensor development to develop research to enhance threat detection training for intelligence analysts, reconnaissance patrol, and force protection security operators. Note: In FY 2013, this Major Thrust moves from Project 635326 to better align efforts. ***FY 2011 Accomplishments:***	-	-	4.344	-	4.344

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635324: *Human Dynamics and Terrain Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A ***FY 2012 Plans:*** N/A ***FY 2013 Base Plans:*** Develop human threat recognition capabilities by creating libraries of human signatures to include simple and complex motions and biofidelic avatars with variable dimensions in gender, age, size, and shape. Demonstrate initial libraries in joint virtual training software for human threat recognition and feasibility for integration into future on-board sensor systems. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	5.981	6.117	9.988	-	9.988

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	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 2013 Air Force			DATE: February 2012
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 635325: *Mission Effective Performance*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635325: *Mission Effective Performance*	4.038	5.149	3.925	-	3.925	2.336	2.685	1.994	2.006	Continuing	Continuing

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 Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	1.572	1.962	3.925	-	3.925
Description: Advance aerospace/organizational behavior models for integrated warfighter training and rehearsal. Add realistic operations, command and control, force protection, and air base defense.					
FY 2011 Accomplishments: Completed field deployment and evaluation of embedded performance measurement and reporting system for combat mission readiness. Developed preliminary functionality for a learning management system for distributed mission operations and LVC training, rehearsal, and exercise. Developed and evaluated 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. Completed 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. Developed specifications for interface and data control approaches for managing learning in LVC contexts. Began development of a reconfigurable and deployable training environment for combat training and rehearsal.					
FY 2012 Plans: Conduct initial evaluations of the reconfigurable and deployable training environment for Air Force applications. Complete evaluation for deployable training for Combatant Commander capability assessment across LVC contexts. Complete specification development for an integrated learning assessment and management system for Distributed Mission Operations (DMO) and LVC operations. Complete and demonstrate team communication					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635325: *Mission Effective Performance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
tracking and assessment methods in Air and Space Operation Center (AOC) and cyber operations training. Define data and interoperability standards for remotely piloted aircraft sensor and pilot training integration in LVC operations. Develop and demonstrate learning management tools. Demonstrate integration of performance metrics in the after action review tool kit. ***FY 2013 Base Plans:*** Demonstrate learning managed LVC for 5th generation air combat mission training. Develop joint criteria, models, and tools for environment certification applicable across LVC contexts. Demonstrate standardized process and integrated toolsets for correlated simulation database development. Note: Funding for this effort increases in FY 2013 to increase emphasis in this area. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 2 ***Description:*** Develop/demonstrate high-fidelity DMO training/rehearsal capability for AOC operators and training technologies for future threat systems/capabilities. ***FY 2011 Accomplishments:*** Developed code, integrated, and tested the execution management capabilities for the simulation set. Developed, integrated, and tested the performance assessment capability within the simulation set. Developed scenario authoring tools and integrate with simulation components. Tested and integrated the entire strategy and plans division trainer and began integration with the AOC part task trainer. Developed vendor-specific real-time database examples from the database generation system's outputs. Began development of methodologies for real-time incorporation of data into DMO, homeland security, and C2ISR databases. Demonstrated a multi-ship/onboard networked LVC EW training concept. Conducted an integrated, on-board EW training demonstration with live aircraft and with a major test/training range. ***FY 2012 Plans:*** Begin definition of multi-level security rule sets for integrated LVC operations across fourth and fifth generation operational systems and different classification enclaves. Develop and demonstrate efficient multi-level rule set definition and accreditation tools for secure training and rehearsal within a single classification enclave. Complete development and demonstration of common competency-based training and assessment for cyber	2.466	3.187	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635325: *Mission Effective Performance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
and LVC operations. Complete transition and field integration of embedded performance assessment system in optional mission training centers. ***FY 2013 Base Plans:*** N/A Note: This effort ends in FY 2012 due to higher Air Force priorities. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	4.038	5.149	3.925	-	3.925

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	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 2013 Air Force			DATE: February 2012
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 635326: *Performance Enhancement Demonstration*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635326: *Performance Enhancement Demonstration*	4.103	4.147	-	-	-	-	-	-	-	Continuing	Continuing

Note

Note: In FY 2013, this project moves to Project 635324 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-taggants 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 Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	1.815	2.046	-	-	-
Description: Demonstrate tailored bio-taggant and identification/neutralization capabilities to enhance force protection and enable air operations commanders to maintain operations tempo. ***FY 2011 Accomplishments:*** Validated selected bio-taggant technologies in the laboratory. Continued to investigate suitable platforms to integrate bio-taggant technologies. ***FY 2012 Plans:*** Validate selected bio-taggant technologies in a simulated operational environment. Identify an integration platform. Demonstrate taggant technology that performs stand off detection of biological agents in an operational environment to include line-of-sight and free-from-sight stand off detection of biological warfare agents and personnel who have been exposed to Weapons of Mass Destruction. ***FY 2013 Base Plans:*** N/A ***FY 2013 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635326: *Performance Enhancement Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 2 ***Description:*** Apply human threat signatures to inform sensor development to develop research to enhance threat detection training for intelligence analysts, reconnaissance patrol, and force protection security operators. ***FY 2011 Accomplishments:*** Demonstrated a morphable 3D dynamic human model that adapts to different sensor input, predicts threat, and optimizes sensor combination and placement for human threat detection. Developed new human shape variation and visualization for threat awareness capability for the deployed airmen. ***FY 2012 Plans:*** Develop training based on physical/physiological indicators of deceptive behavior. Initiate development of software training module for human threat indicators. Provide requirements for sensor resolution and optimized sensor placement for human threat indicator detection. ***FY 2013 Base Plans:*** N/A ***FY 2013 OCO Plans:*** N/A	2.288	2.101	-	-	-
Accomplishments/Planned Programs Subtotals	4.103	4.147	-	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	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 2013 Air Force			DATE: February 2012
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 635327: *Warfighter Interfaces*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635327: *Warfighter Interfaces*	6.991	7.584	6.570	-	6.570	5.275	5.229	4.572	4.320	Continuing	Continuing

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 Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1	2.555	4.553	1.457	-	1.457
Description: Develop immersion technologies and augmented vision, to facilitate team building and workflow in a distributed C2 environment and exploit telepresence in urban operations. Develop job performance aiding technologies that assess workload and performance to more effectively determine work re-allocation in a C2 distributed environment. ***FY 2011 Accomplishments:*** Developed 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. Integrated and tested functionality of the modular distributed tools for demonstration in various C2 team decision making environments. Initiated technology demonstrations in representative users' cyber environments. Developed visual interface and incorporate advanced algorithms for planning military mobility operations. Demonstrated the ability to exploit automated planning to optimize the use of resources within Joint Deployment and Distribution Enterprise capacity constraints. Provided 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. ***FY 2012 Plans:*** Develop technology to assess the value of operator immersion and related virtual presence technology for improving human and mission performance, design novel warfighter visualizations, and develop intuitive control methods for exercising telepresence in the urban battlespace. Develop conceptual operator telepresence					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
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 635327: *Warfighter Interfaces*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
interfaces (remote and on-scene) for the larger context of supervisory control of the sensor networks and ISR services. Assess hardware and software technology options for developing team workload and performance detection capability and visualization requirements. Begin to develop and plan to integrate both on-human and off-human sensors. Work with command and control operational users from Control and Reporting Centers to identify characteristics of team membership and visualization requirements. ***FY 2013 Base Plans:*** Develop neurophysiologic sensored technology for determining operator workload. Integrate neurophysiologic sensors with automated system adaptation methods, software, and tools. Identify visualization, tool composition, and user interface requirements to support cyber operations. Analyze human operator team composition and requisite skill sets based upon cyber tool set composition and information flow. Based upon human-computer interface requirements analyses, provide training recommendations for the transition of cyber offensive tools to the operational community. Note: Decrease in FY13 is due to higher Air Force priorities. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 2 ***Description:*** Demonstrate ability to forecast acoustic profiles for any atmospheric/terrain condition. Demonstrate technologies to enhance the battlefield airman's situational awareness through wearable interfaces. ***FY 2011 Accomplishments:*** Completed final evaluations of integrated components. Demonstrated 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. Conducted laboratory evaluations to assess effectiveness of integrated system and compare performance to original baseline. Conducted field evaluations of technology components and prepare for transition to operational capability. ***FY 2012 Plans:*** Integrate a high fidelity acoustic simulation model into existing Air Force fielded software applications to demonstrate technology in the user's environment. Perform initial proof-of-concept verification and validation of the integrated acoustic model. Develop and test field data collection procedures to validate the acoustic	1.463	0.971	1.823	-	1.823

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
predictions of sound propagation and source characterization. Collect soundscape data for a background noise database. Perform related research on human hearing and vigilance. ***FY 2013 Base Plans:*** Develop three-dimensional acoustic models of manned and unmanned aircraft for incorporation into high-fidelity acoustic mission planning tools. Collect high-fidelity three-dimensional acoustic measurements of manned and unmanned aircraft. Determine aural detectability across a wide range of weather conditions, geography, and background sounds. Employ usability engineering methodologies to establish user requirements and use-case scenarios for the para-rescue jumper community. Prototype designs of wearable interface concepts. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 3 ***Description:*** Develop and demonstrate an integrated human-centered interface to control multiple RPA that have various levels of autonomy and that optimize net-centric information flow. ***FY 2011 Accomplishments:*** Completed the development of advanced multi-RPA control station technology for dynamic reconnaissance, surveillance, and time-critical target acquisition missions. Completed the integration of cooperative engagement algorithms and operator interface technologies for technology demonstration. Completed 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. Determined how many vehicles an RPA operator can effectively manage/supervise. ***FY 2012 Plans:*** Analyze warfighter requirements for a future generation control station that will accommodate advanced and legacy RPAs. Develop and integrate operator interface controls, displays, and decision-aid technologies for effective situation assessment, decision-making, and action implementation to manage semi-autonomous, multi-mission RPAs and heterogeneous payloads. Test control station technology to determine baseline functionality and performance. ***FY 2013 Base Plans:*** Validate warfighter requirements for the next generation operator control station that will accommodate advanced and legacy RPAs. Integrate and test operator interface controls, displays, and decision-aids to	1.422	1.032	3.290	-	3.290

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
manage multi-mission RPAs and payloads. Conduct prototype evaluations of operator interface controls. Perform initial testing of technologies designed to assess the value of RPA operator immersion and telepresence for improving human and mission performance. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 4 ***Description:*** Develop cognitive-based analytic/design methods and computer software tools for C2 operations to synchronize personnel in distributed locations and obtain visually intuitive battlespace awareness. ***FY 2011 Accomplishments:*** Demonstrated and evaluate a unifying C2 work-aiding framework supporting distributed cross-organizational teams and individuals, including integration of a representative set of existing tools. Examined results and refine work-centered analytic, design, and development methods and techniques as applied to teams. ***FY 2012 Plans:*** N/A Note: This effort completed in FY 2011. ***FY 2013 Base Plans:*** N/A ***FY 2013 OCO Plans:*** N/A	1.551	-	-	-	-
Title: Major Thrust 5 ***Description:*** Develop and demonstrate space visualization technologies that provide visually intuitive awareness of the battlespace, including trend portrayal useful for decision making. ***FY 2011 Accomplishments:*** N/A ***FY 2012 Plans:***	-	1.028	-	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Examine and analyze the workflow and information required to provide warfighters with an inherent awareness of the operational space situation. Exploit available cognitive task analyses of space operations and develop user requirements for visualization tools that simplify the process of portraying relevant data from large data sets. Develop and test laboratory prototypes of visualization tools developed from user-derived requirements. ***FY 2013 Base Plans:*** N/A Note: This effort ends in FY 2012 due to higher Air Force priorities. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	6.991	7.584	6.570	-	6.570

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	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.