PE NUMBER: 0603231F
PE TITLE: Crew Systems and Personnel Protection Technology

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2004
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603231F Crew Systems and Personnel Protection Technology

	Cost ($ in Millions)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
	Total Program Element (PE) Cost	37.959	42.822	32.794	32.525	33.129	33.685	34.224	Continuing	TBD
2830	Decision Support and Cognitive Systems	8.128	8.865	6.369	6.236	6.187	6.291	6.393	Continuing	TBD
3257	Helmet-Mounted Sensory Technologies	7.304	7.636	4.788	5.327	5.421	5.511	5.599	Continuing	TBD
4923	Logistics Readiness and Sustainment	7.076	12.463	10.532	10.847	11.204	11.393	11.575	Continuing	TBD
4924	Distributed Mission Training Technology	6.535	6.475	7.220	7.160	7.161	7.281	7.397	Continuing	TBD
5020	Directed Energy Protective Systems	8.916	7.383	3.885	2.955	3.156	3.209	3.260	Continuing	TBD

Note: In FY 2003, the Directed Energy Protective Systems program at Brooks City-Base, Texas, moved from Project 3257 to Project 5020 to align resources with the Air Force Research Laboratory organization.

(U) A. Mission Description and Budget Item Justification

This program develops and demonstrates technologies to enhance human performance and effectiveness and to enable the aerospace force. State-of-the-art advances are made to train personnel, protect and sustain warfighters, and improve human interfaces with weapon systems. The Decision Support and Cognitive Systems project develops and demonstrates crew system interface technologies and information operations technologies that promote effective decision-making, control, and execution in operational environments. The Helmet-Mounted Sensory Technologies project develops and demonstrates advanced operator interface technologies for multi-functional helmet-mounted displays and night vision devices, and laser eye protection. The Logistics Readiness and Sustainment project develops and demonstrates technologies that will protect the force, enhance logistics, and improve the design, deployability, performance, and support of current and future weapon systems. The Distributed Mission Training Technology project develops and demonstrates advanced training, simulation, and mission rehearsal technologies. The Directed Energy Protective Systems project develops and demonstrates advanced technologies for laser eye protection and for assuring the safety of personnel involved with test, deployment, and operation of high-energy laser weapons and systems. Note: In FY 2004, Congress added $1.4 million for Laser Eye Protection Research, $1.4 million for Virtual Warriors, $1.8 million for Crew Systems Personnel Protection, $1.7 million for Helmet Cueing System, $1.0 million for The Logistics Institute, and $1.4 million for Total Atmospheric Liquefaction for Oxygen and Nitrogen (TALON).

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	DATE February 2004
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603231F Crew Systems and Personnel Protection Technology

(U) B. Program Change Summary ($ in Millions)

		FY 2003	FY 2004	FY 2005
(U)	Previous President's Budget	39.235	34.487	32.881
(U)	Current PBR/President's Budget	37.959	42.822	32.794
(U)	Total Adjustments	-1.276	8.335	
(U)	Congressional Program Reductions			
	Congressional Rescissions		-0.365	
	Congressional Increases		8.700	
	Reprogrammings	-0.542		
	SBIR/STTR Transfer	-0.734		
(U)	Significant Program Changes:			
	Not Applicable.			

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE: 2830 Decision Support and Cognitive Systems	

Cost ($ in Millions)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
2830	Decision Support and Cognitive Systems	8.128	8.865	6.369	6.236	6.187	6.291	6.393	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project provides technology to improve human combat performance, combat support performance, and aerospace safety through better information delivery and crew station integration, which are achievable through effective decision support and cognitive systems engineering. Crew stations represent the fundamental interface between the warfighter and equipment across the gamut of aerospace operations. To cope with the recognized data overload in command centers and weapon platforms, this project develops technologies to quantify requirements, develop information interfaces, and evaluate crew performance in selected operational environments. This project includes bioacoustic technologies to complement decision support and visual information technologies as part of an integrated solution to negate information overload in the Air Expeditionary Force environment, while improving sound cueing, voice communications, and hearing protection for weapon systems operators, command centers, and security forces.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop and demonstrate user-tailored information management and portrayal technologies that enhance battlespace situational awareness for global- and MAJCOM-level information warfare and air operations centers to reduce decision-making bottlenecks.	2.708	3.222	1.500

(U) In FY 2003: Transitioned and integrated initial version of combat assessment tools into joint and/or Air Force weapon systems. Developed decision-making process and model to characterize different types of adversary systems and assess alternative ways they may be favorably influenced by allied force actions. Developed speech recognition front-end and advanced visualization for operations centers' information management tool. Improved flow of time-critical targeting information into strike aircraft to enhance pilot situational awareness, exploiting capabilities inherent with helmet-mounted display technology.

(U) In FY 2004: Develop a decision-making modeling, simulation, and analysis tool to evaluate different types of adversary systems and to assess alternative ways they may be favorably influenced by allied force actions. Integrate this tool into next-generation planning and combat assessment tools to demonstrate enhanced information warfare planning. Develop dynamic user tailoring for operation centers' information management tool.

(U) In FY 2005: Integrate a decision-making modeling, simulation, and analysis tool into final version of previously demonstrated combat assessment tool and transition into joint and/or Air Force weapon systems. Develop collaborative information sharing for operation centers' information management tool. Complete and integrate final version information management tool into joint and/or Air Force weapon systems.

(U)

Exhibit R-2a, RDT&E Project Justification			DATE February 2004
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE 2830 Decision Support and Cognitive Systems	

(U)	MAJOR THRUST: Develop advanced high-performance bioacoustic hearing protection technologies to achieve 40-45 dB noise attenuation for personnel working in and around fighter aircraft.	0.893	0.000	0.000
(U)	In FY 2003: Demonstrated communication capability in 150 dB noise fields. Integrated deep insert earplug technology with active noise reduction to achieve 45 dB field attenuation. Demonstrated improved attenuation and user acceptability in laboratory and field environments.			
(U)	In FY 2004: Not Applicable. Note: Major thrust completed in FY 2003.			
(U)	In FY 2005: Not Applicable.			
(U)				
(U)	MAJOR THRUST: Develop and demonstrate advanced audio technologies to enhance security force situational awareness and threat response time using acoustic sensors.	1.459	0.947	0.000
(U)	In FY 2003: Demonstrated to deployed security forces an improved situational awareness capability by using intelligent algorithms, three-dimensional (3-D) audio, and audio symbology to code the detected threats and assist in threat intervention. Demonstrated at a military exercise the operational payoff from using 3-D audio radios and helmets in a mobile patrol squadron. Developed an automated threat assessment system to evaluate the severity and importance of detected noise.			
(U)	In FY 2004: Demonstrate a user-centered interface to improve threat level and location awareness for security force command, as well as automated acoustic threat detection, localization and classification of foot traffic, land vehicles, air vehicles, and munitions firing. Demonstrate during a military exercise the operational payoff from using the combination of acoustic sensors, multimedia displays at the command center, and three-dimensional audio radios to assist mobile patrol squads.			
(U)	In FY 2005: Not Applicable. Note: Technology will transition to Special Operations Forces in FY 2004 for testing.			
(U)				
(U)	MAJOR THRUST: Develop and demonstrate human-centered science and technology for the Air Force Information Warfare (IW) community. This technology will provide the IW warrior with tailored decision support systems, guidelines for effective selection of information warriors, information operations simulators and training systems, improved operational shift schedules to increase personnel efficiency and effectiveness, enhanced decision-making tools, and automated tools to reduce operator task load.	1.320	1.970	2.069
(U)	In FY 2003: Performed initial operating capability (IOC) baseline review and process study to develop tools to influence human senses. Technologies will enable perception management and deception, model and simulate human behavior, develop adversary cultural and decision models, enhance predictive battlespace awareness, and improve interaction and monitoring capability by determining effectiveness of automated tools in support of intelligence and information warfare units.			
(U)	In FY 2004: Develop technologies to provide human-centered alternatives to current IW architectures, systems, processes, and operations. Technologies will focus on predictive battlespace awareness and tailored decision support			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE 2830 Decision Support and Cognitive Systems

systems and tools to augment human operators' performance. Finalize IOC process study and develop a modernization plan for IW as well as a detailed plan to support future demonstrations of IW tools, training, and requirements.

(U) In FY 2005: Develop and demonstrate tools, methods, and technology to gain, exploit, defend, and attack information. Identify and prioritize Information Warfare (IW) capabilities for enhancement by exemplar technologies and methods. Develop, demonstrate, and evaluate IW support tools and technologies to assess operational impact.

(U)

(U)	MAJOR THRUST: Develop and demonstrate human effectiveness technology to improve combat effectiveness reporting, situation assessment updates, and decision support for Combined Air Operations Centers (CAOC). Note: New application of technology in FY 2004 from first major thrust.	0.000	1.338	2.800
(U)	In FY 2003: Not Applicable.			
(U)	In FY 2004: Perform cognitive task analysis of key CAOC positions and develop measures of performance and effectiveness. Begin to develop visualizations promoting battlespace situational awareness.			
(U)	In FY 2005: Develop user-tailorable visualizations to optimize human perception of battlespace situational awareness. Demonstrate enhanced collaborative capability for effective, time-critical information exchange operations between CAOC and other operational units.			
(U)				
(U)	CONGRESSIONAL ADD: Virtual Warriors. Note: Formerly known as Combat Automation Requirement Testbed in FY 2003.	1.748	1.388	0.000
(U)	In FY 2003: Extended human modeling and simulation technologies to make effective trade-offs between crew system concepts and mission effectiveness. Analyzed and developed integrated crew system concepts to reduce manning within air operations centers, showing contribution of human modeling to substantiate time-critical targeting effectiveness and affordability. Developed extensions to the simulation testbed that will provide the capability to objectively and systematically assess the overall sensor-to-shooter process for time-critical targets.			
(U)	In FY 2004: Integrate human modeling and simulation technologies into distributed simulation exercises to reduce manning within air operations centers and to shorten time-critical targeting cycle times.			
(U)	In FY 2005: Not Applicable.			
(U)	Total Cost	8.128	8.865	6.369

(U) C. Other Program Funding Summary ($ in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
(U) Related Activities:									
(U) PE 0602202F, Human									

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **2830 Decision Support and Cognitive Systems**

(U) C. Other Program Funding Summary ($ in Millions)

(U) Effectiveness Applied Research.

(U) PE 0604706F, Life Support Systems.

(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE: 3257 Helmet-Mounted Sensory Technologies	

Cost ($ in Millions)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
3257	Helmet-Mounted Sensory Technologies	7.304	7.636	4.788	5.327	5.421	5.511	5.599	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

Note: In FY 2003, the Directed Energy Protective Systems program at Brooks City-Base, Texas, moved from Project 3257 to Project 5020 to align resources with the Air Force Research Laboratory organization.

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced technologies for ejection-safe, multi-functional Helmet-Mounted Displays and night vision devices. Development of helmet-mounted tracker and display (HMT/D) technologies will enable pilots to detect, identify, target, and launch weapons faster and more accurately. Development of improved aircrew Night Vision Goggle (NVG) technologies will enhance aerial combat capabilities at night.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop and demonstrate advanced Helmet-Mounted Tracker and Display (HMT/D) and subsystem technologies to improve mission effectiveness and pilot situational awareness during day and night missions in all-weather conditions. These technologies help pilots to detect, identify, target, and engage with weapons faster and more accurately.	3.893	2.313	1.845
(U) In FY 2003: Investigated and developed advanced symbology sets for tactical HMT/Ds to improve targeting, increase situational awareness, and reduce spatial disorientation. Integrated ultrasonic transducers with inertial head tracker to improve tracker accuracy. Investigated utility of advanced daytime HMT/D incorporating miniature color display for future simulations and flight evaluations.			
(U) In FY 2004: Demonstrate advanced symbology sets for tactical HMT/Ds in an operational environment to assess improvements to targeting, to increase situational awareness, and to reduce spatial disorientation. Demonstrate and assess utility of advanced head tracker that improves tracker accuracy, reduces system latency, and reduces mobility footprint.			
(U) In FY 2005: Assess capability of integrated technology application of advanced symbology sets and advanced head tracker at night to reduce target acquisition and engagement timelines. Demonstrate real-time target information on HMT/D to destroy time-critical ground targets. Demonstrate space-stabilized head-up displays on HMT/D in laboratory.			
(U)			
(U) MAJOR THRUST: Develop and demonstrate technologies for improved aircrew night vision goggles to increase mission effectiveness and enhance air operations by allowing the pilot to perform daytime tactics at night.	1.504	0.000	0.000
(U) In FY 2003: Incorporated and evaluated laser-hardening technologies for image intensifier tube. Integrated a HMT/D			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **3257 Helmet-Mounted Sensory Technologies**

	with the Integrated Panoramic Night Vision Goggle.			
(U)	In FY 2004: Not Applicable. Note: Technology transitioned to Joint Helmet Mounted Cueing System Program Office in FY 2003.			
(U)	In FY 2005: Not Applicable.			
(U)				
(U)	MAJOR THRUST: Develop and demonstrate advanced visual display technologies to provide integrated day/night capability for reducing pilot workload and enhancing mission performance. Note: New application of technology in FY 2004 from previous major thrust.	0.000	2.910	2.943
(U)	In FY 2003: Not Applicable.			
(U)	In FY 2004: Assess capabilities of emerging night vision devices and investigate head-mounted, multi-channel displays. Develop technologies to reduce bulk and head-supported weight required by existing cathode ray tube-based designs to improve aircrew safety and comfort.			
(U)	In FY 2005: Develop and integrate miniature digital night vision devices and with head-mounted multi-channel displays to optimize display of information to aircrew. Investigate the utility of new displays for providing imagery and video to the aircrew to reduce time looking at head-down displays in the cockpit. Assess leading edge display technologies to support fielding of laser eye protection and laser hardening technologies with advanced Helmet-Mounted Tracker and Displays and night vision goggles.			
(U)				
(U)	MAJOR THRUST: Develop and demonstrate subsystems to protect the aircrew member wearing Helmet-Mounted Displays (HMDs) during emergency ejection in current and future high-performance fighter aircraft. Aerodynamic lift-reducing helmet concepts will provide a decrease in head and neck injuries for crewmembers wearing HMDs during high-speed emergency ejections.	0.937	0.727	0.000
(U)	In FY 2003: Conducted tests to verify head, neck, and eye protection are provided to 600 Knots Equivalent Air Speed (KEAS) threshold, 700 KEAS objective.			
(U)	In FY 2004: Identify candidate lift-reducing concepts and integrate helmet design with emerging HMD designs. Conduct impact, windblast, and ejection sled tests to verify performance under high-speed ejection conditions.			
(U)	In FY 2005: Not Applicable. Note: Major thrust will be completed in FY 2004.			
(U)				
(U)	CONGRESSIONAL ADD: Helmet Cueing System Technology.	0.970	1.686	0.000
(U)	In FY 2003: Developed and demonstrated advanced head tracker technologies to improve helmet cueing capabilities for onboard weapons and sensors.			
(U)	In FY 2004: Transition the advanced head tracker and related helmet cueing technologies from the laboratory environment to the operational environment. Develop and package the advanced head tracker including integration with an operational aircraft's sensors and weapons, in preparation for a flight demonstration of the new helmet cueing			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **3257 Helmet-Mounted Sensory Technologies**

capability.

(U) In FY 2005: Not Applicable.

(U) Total Cost	7.304	7.636	4.788

(U) C. Other Program Funding Summary ($ in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
(U) Related Activities:									
(U) PE 0602202F, Human Effectiveness Applied Research.									
(U) PE 0602102F, Materials.									
(U) PE 0603112F, Advanced Materials for Weapon Systems.									
(U) PE 0603319F, Airborne Laser Program.									
(U) PE 0604706F, Life Support Systems.									
(U) PE 0604201F, Integrated Avionics Planning and Development.									
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.									

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE: 4923 Logistics Readiness and Sustainment	

Cost ($ in Millions)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
4923 Logistics Readiness and Sustainment	7.076	12.463	10.532	10.847	11.204	11.393	11.575	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies that will enhance logistics support functions; improve the effectiveness of logistics information systems and command and control systems; enhance the fidelity and accuracy of large-scale military simulations; and improve the protection of personnel in deployed environments. This includes technologies to model and simulate intelligent behavior; to better integrate the human with computer-based information systems; to provide near real-time status of logistics resources and aircraft status; and to perform earlier prediction of the effects of exposure to hazardous chemicals. The resulting efforts will improve warfighter decision-making in the areas of logistics management, command and control, and force protection.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop and demonstrate intelligent software agents and realistic human and organizational behavior models. These computer agents and models will add realism and fidelity to large-scale synthetic environments and war games, provide intelligence analysts a way to model collected data, and improve the user interaction with logistics information systems.	2.200	2.777	2.123
(U) In FY 2003: Demonstrated intelligent software agents that emulate potential enemy integrated air defense command and control echelons. These agent-based models incorporated cultural behavioral differences observed in the real world.			
(U) In FY 2004: Demonstrate software architecture for behavior modeling that can be readily tuned to different personality types. The models being developed will simulate potential enemy command and control decision-making at the air component commander level of control.			
(U) In FY 2005: Develop human behavior based computer models that enable the study of information operations on command and control echelons and that better represent logistics functions in synthetic exercises.			
(U)			
(U) MAJOR THRUST: Develop and demonstrate logistics technologies for improved deployment operations and improved system supportability. These technologies will maximize the efficiency and effectiveness of Air Force deployments and mobility operations in support of Agile Combat Support initiatives and Air Expeditionary Force concepts.	2.540	4.489	3.072
(U) In FY 2003: Developed initial software tool set to provide wing commanders and senior logisticians with advanced logistics information and management capabilities, including rapid access to real-time resources status information, proactive problem identification, decision support, and process tracking.			
(U) In FY 2004: Complete development of software tool set to provide wing commanders and senior logisticians with			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4923 Logistics Readiness and Sustainment**

advanced logistics information and management capabilities, including rapid access to real-time resources status information, proactive problem identification, decision support, and process tracking. Begin to assess and develop technology to automatically collect and update critical information required to effectively manage logistics resources in support of combat operations.

(U) In FY 2005: Continue to develop and apply technology to automatically collect and update critical information required to effectively manage logistics resources in support of combat operations. Begin to design and develop very fast, easy-to-use simulation capabilities for Air Force units to optimally apply limited logistics resources during operation.

(U)

(U) MAJOR THRUST: Develop and demonstrate advanced job performance aiding technologies to enhance the utility of global air mobility command and control systems. These technologies will provide command and control operators with automated access to a manageable amount of critical information from multiple sources to avoid operator overload and thus support faster, more accurate decision-making and problem resolution during mobility operations.	1.366	1.471	2.613

(U) In FY 2003: Developed and demonstrated software to provide advanced user interfaces by combining intelligent agents and artificial intelligence software with automated, work-centered collaborative planning and decision support technologies to automatically identify weather impacts on air mobility missions.

(U) In FY 2004: Develop artificial intelligence software, work-centered collaborative planning tools, and advanced decision support technologies to augment global air mobility command and control systems.

(U) In FY 2005: Continue to develop artificial intelligence software that can automatically draw conclusions, develop work-centered collaborative planning tools, and develop advanced decision support technologies. Demonstrate these technologies in an operational environment within the Tanker Airlift Control Center.

(U)

(U) MAJOR THRUST: Develop and demonstrate technologies that will enhance and streamline aircraft maintenance processes to improve the Air Force's ability to meet Air Expeditionary Force requirements by providing faster and more accurate methods of diagnosing and predicting component failures.	0.000	2.734	2.724

(U) In FY 2003: Not Applicable. Note: Funds redirected to higher Air Force priorities.

(U) In FY 2004: Begin to develop cognitive decision technologies, new information fusion techniques, and algorithms to determine failure trends for improved maintenance troubleshooting. Develop revolutionary formats for presenting technical information and software tools that support collaborative problem-solving during aircraft maintenance.		-	

(U) In FY 2005: Continue to develop cognitive decision technologies, new information fusion techniques, and algorithms to determine failure trends for improved maintenance troubleshooting. Continue to develop revolutionary formats for presenting technical information and software tools that support collaborative problem solving during aircraft maintenance.

(U)

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4923 Logistics Readiness and Sustainment**

(U)	CONGRESSIONAL ADD: The Logistics Institute. Note: FY 2004 add is a continuation of the FY 2003 add titled Battlespace Logistics Readiness and Sustainment.	0.970	0.992	0.000
(U)	In FY 2003: Developed and demonstrated technologies that will enhance Air Force maintenance and supply processes and improve the design, deployability, performance, and logistics support of current and future weapon systems.			
(U)	In FY 2004: Continue to develop and demonstrate technologies that will enhance Air Force maintenance and supply processes and improve the design, deployability, performance, and logistics support of current and future weapon systems.			
(U)	In FY 2005: Not Applicable.			
(U)	Total Cost	7.076	12.463	10.532

(U) C. Other Program Funding Summary ($ in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
(U) Related Activities:									
(U) PE 0602201F, Aerospace Flight Dynamics.									
(U) PE 0602202F, Human Effectiveness Applied Research.									
(U) PE 0603721N, Environmental Protection.									
(U) PE 0604708F, Civil, Fire, Environmental, Shelter.									
(U) PE 0604740F, Integrated Command and Control Applications.									
(U) PE 0605801A, Programwide Activities.									
(U) PE 0708011F, Industrial Preparedness.									
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate									

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4923 Logistics Readiness and Sustainment**

(U) C. Other Program Funding Summary ($ in Millions)

duplication.

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603231F Crew Systems and Personnel Protection Technology	PROJECT NUMBER AND TITLE: 4924 Distributed Mission Training Technology	

Cost ($ in Millions)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
4924	Distributed Mission Training Technology	6.535	6.475	7.220	7.160	7.161	7.281	7.397	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced training, simulation, and mission rehearsal technologies that will improve warfighter capabilities and mission readiness by enhancing operator and team performance skills. This effort includes the development of technologies that enable integration of computer models, live weapon systems, and weapon system simulators to portray the global battlespace, including all-weather, day/night flight operations, command and control, force protection, and aerospace operations. This project develops and demonstrates advanced training and simulation technologies that will improve warfighter readiness by enhancing mission training and mission rehearsal capabilities. Development and effective use of this global battlespace requires advances in training systems, interconnection, information, visual, and representation technologies. The resulting mission training and rehearsal capabilities will enhance the mission essential competencies of the combat and combat support individuals and teams that comprise the aerospace force.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Advance warfighter integrated training and rehearsal for aerospace operations, command and control, force protection, and air base defense warfighters. Technologies will increase training effectiveness and efficiency, and decrease time to mission qualification.	2.422	1.680	1.063

(U) In FY 2003: Developed and validated training technologies and methods to enable deployed personnel to maintain mission essential skills. Implemented and evaluated the next generation threat system in Distributed Mission Training (DMT) testbed.

(U) In FY 2004: Develop mission essential competency analysis toolset for air superiority that identifies those critical knowledge, skills, and experiences that are important enablers of mission performance for individuals and teams. Develop specifications for virtual and live training performance assessment and measurement to enable deployed personnel to maintain mission essential skills, and develop training and simulation technologies that will enable integrated command and control training within the DMT environment. Demonstrate competency-based design of a simulator performance measurement and tracking system, and develop a stand-alone performance monitoring and tracking capability for live-fly instrumented range data.

(U) In FY 2005: Develop and validate capability to conduct integrated command and control and combat employment training and rehearsal. Develop specifications for a deployable Distributed Mission Operations (DMO) training and rehearsal technology suite for full combat tactical weapons employment mission planning, training, and rehearsal. Complete collaborative toolset for mission analysis and tracking. Demonstrate an integrated live-fly and virtual simulation performance measurement capability and evaluate its operational utility. Complete first DMO skills

Exhibit R-2a, RDT&E Project Justification		DATE February 2004	
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4924 Distributed Mission Training Technology**	

development, assessment, and decay study for combat air forces.

(U)

(U) MAJOR THRUST: Develop and demonstrate the application of information and communications technologies for realistic mission training and mission rehearsal in a distributed simulation environment. These technologies will increase readiness training by enabling more realistic employment of weapon systems within a horizontally and vertically integrated system of sensors, command and control, and weapons platforms. — 0.679 | 1.288 | 0.000

(U) In FY 2003: Demonstrated the capability to establish a High-Level Architecture (HLA) federation that provides aircrew and command and control training to geographically separated audiences. Demonstrated an HLA federation to enable distributed mission training to operate at multiple security levels.

(U) In FY 2004: Demonstrate a near-real-time HLA based training environment enabling aircrew and command and control training for geographically separated training audiences. Validate performance of an HLA network guard federation operating at multiple security levels and produce documentation to support certification and accreditation.

(U) In FY 2005: Not Applicable. Note: Technology will transition to the Distributed Mission Operations Center in FY 2004.

(U)

(U) MAJOR THRUST: Demonstrate advances in simulator visual system technologies through the development of ultrahigh resolution projection systems, low-cost high-fidelity image generator, and thin-film holographic collimating display technologies. Technologies will create high-definition immersive virtual environment for aircrew readiness training and mission rehearsal, increasing mission rehearsal capability for the warfighter. — 1.568 | 1.785 | 3.280

(U) In FY 2003: Developed and demonstrated less expensive, thin-film holographic collimating display components for the simulator. Developed and demonstrated a proof-of-concept ultrahigh resolution, color laser projector. Integrated and evaluated high-bandwidth PC-based image generator with high-resolution laser projector.

(U) In FY 2004: Fabricate and evaluate efficient, full-size, thin-film holographic collimating screen materials. Develop a 5120 x 4096 pixel low-cost PC-based image generator.

(U) In FY 2005: Design and fabricate the frame and display structure for the next generation, full field-of-view 20/20 visual display system. Integrate proof-of-concept ultrahigh-resolution laser projectors with open-standard external interfaces, capable of displaying over ten times the resolution currently displayed by commercial High-Definition Television (HDTV) projectors. Design and develop high-performance, low-cost image generator based on commodity graphics along with a high-resolution terrain database to provide visual and sensor imagery at 60 HZ. Integrate advanced visual technologies to create the 20/20 Immersive Visual Display.

(U)

(U) MAJOR THRUST: Develop and demonstrate training technologies and techniques to optimize night vision device-aided night operations. These technologies will reduce the cost of Night Vision Goggle (NVG) qualification and increase combat capability. — 1.866 | 0.843 | 1.400

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4924 Distributed Mission Training Technology**

(U) In FY 2003: Completed generic NVG simulation and generic Forward Looking Infrared simulation using the same tools used for NVG functionality, allowing for high-fidelity, completely correlated visible and sensor simulation imagery. Developed proof-of-concept for dual mode, covert and overt, external aircraft lighting for fighter aircraft. Completed digital conversion of introductory and instructor courseware. Developed simulator-based training scenarios for initial qualification, spatial orientation, and advanced combat night operations.

(U) In FY 2004: Develop guidelines to introduce NVG training during pilot training. Transition and implement high fidelity NVG simulation into Distributed Mission Training and Formal Training Unit facilities. Develop performance metrics for NVG scan, crosscheck and spatial orientation. Develop and evaluate two-ship simulator scenarios for NVG initial and continuation training. Develop an annual NVG refresher course suitable for use in deployed status.

(U) In FY 2005: Develop the functional specification for a desktop Night Vision Goggle (NVG) visualization trainer suitable for initial NVG familiarization training, mission planning/preview, and mishap investigation. Develop and evaluate simulator based spatial orientation scenarios for NVG use. Determine the training value of high-fidelity NVG visual simulation on mission qualification time.

(U)

(U) MAJOR THRUST: Develop and demonstrate a high-fidelity Distributed Mission Operations (DMO) training and rehearsal capability for operators in an Air Operations Center (AOC). Link AOC operational mission requirements and principles of instruction to enable effective and efficient training at both the AOC Formal Training Unit and the operational units.	0.000	0.879	1.477
(U) In FY 2003: Not Applicable. Note: New application of research in FY 2004 from first major thrust.			
(U) In FY 2004: Develop specifications, strategies, and methods for individual-, team-, and division-level training and rehearsal within an AOC. Develop preliminary guidelines and metrics for assessing mission readiness levels for AOC members. Explore individual-level simulation-based training capabilities.			
(U) In FY 2005: Develop preliminary competency-based requirements for use at the operational units and evaluate alternative content development and delivery methods. Develop tools and authoring shells for courseware development. Evaluate alternative local and DMO training and rehearsal technologies in operational exercises and experiments.			
(U) Total Cost	6.535	6.475	7.220

(U) C. Other Program Funding Summary ($ in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost

(U) Related Activities:

(U) PE 0602202F, Human Effectiveness Applied Research.

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **4924 Distributed Mission Training Technology**

(U) C. Other Program Funding Summary ($ in Millions)

(U) PE 0604227F, Distributed Mission Training.

(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification

DATE: February 2004

BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603231F Crew Systems and Personnel Protection Technology

PROJECT NUMBER AND TITLE: 5020 Directed Energy Protective Systems

Cost ($ in Millions)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
5020 Directed Energy Protective Systems	8.916	7.383	3.885	2.955	3.156	3.209	3.260	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

Note: In FY 2003, the Directed Energy Protective Systems program at Brooks City-Base, Texas, moved from Project 3257 to Project 5020 to align resources with the Air Force Research Laboratory organization.

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced technologies for Laser Eye Protection (LEP) and for assuring safety of personnel involved with test, deployment, and operation of high-energy laser weapons and systems. The project develops technologies to provide protection against laser threats and hazards, without compromising performance, vigilance, and mission effectiveness. It also develops tools and guidelines for testing and deploying high-energy laser systems and technologies to enhance personnel safety and effectiveness in aerospace operations.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop and demonstrate multi-wavelength Laser Eye Protection (LEP) technologies for aircrew and ground personnel to provide protection against any laser hazard or threat in a single device.	1.305	1.586	1.600
(U) In FY 2003: Evaluated LEP/laser-hardened night vision goggle compatibility and integration issues. Evaluated performance of mini-band clip-on device to provide selected, multi-wavelength LEP and received safe-to-fly certification. Demonstrated first phase of a Laser Detector and Warning system toward integration into aircraft cockpits and with multi-wavelength LEP.			
(U) In FY 2004: Begin evaluating and integrating optical limiters, tunable liquid crystals, photochromic and electrochromic materials, reflective technologies, and advanced dyes toward demonstration of agile LEP. Continue development, integration, and evaluation of LEP spectacles with laser-hardened NVGs. Continue supporting development and evaluation of a Laser Detector and Warning system toward integration into aircraft cockpits and agile LEP. Evaluate human performance of second mini-band clip-on device to provide selected, multi-wavelength LEP.			
(U) In FY 2005: Evaluate human performance of third mini-band clip-on device to provide selected, multi-wavelength LEP. Complete support for development and evaluation of a Laser Detector and Warning system for integration into aircraft cockpits and agile LEP. Complete aircrew evaluations of peripheral LEP protection for wear with laser hardened Night Vision Goggles.			
(U)			
(U) MAJOR THRUST: Develop and demonstrate technologies that permit safe testing, deployment, and use of high-energy laser weapons and systems.	0.707	0.869	1.435
(U) In FY 2003: Completed laboratory experiments and field measurements to support initial Validation, Verification,			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **5020 Directed Energy Protective Systems**

	and Accreditation of Version 1, Laser Range Safety Tool for Test Range Commanders and Safety Officials employing High Energy Laser Systems. Completed several key bioeffects studies to anchor the damage threshold on sub-microsecond high-energy laser pulses. Integrated a biological dose-response curve, required for probabilistic risk assessment of laser hazards, into the Laser Range Management Software for use in Advance Tactical Laser collateral hazard analyses.			
(U)	In FY 2004: Release version 2.0 of Laser Range Safety Tool (LRST) and complete integration with laser test range personnel to permit rapid analysis of high energy laser test operations. Integrate laser bioeffects data to refine laser safety parameters for computer code supporting LRST. Refine software damage models for high-energy laser weapons based on bioeffects studies and field test measurements.			
(U)	In FY 2005: Begin development effort for real-time LRST permitting commanders and range personnel immediate response on laser safety predictions arising from use of the Airborne Laser. Demonstrate Probabilistic Risk Assessment as an approach to high energy laser range safety. Complete revisions to national consensus standards for near infrared wavelengths. Begin development of Phase II of the LRST.			
(U)				
(U)	MAJOR THRUST: Develop and demonstrate biomolecular sensors to support testing of counterforce technologies and neutralization of biological weapons. Note: Technology from PE 0602202F will transition to this new major thrust in FY 2005.	0.000	0.000	0.494
(U)	In FY 2003: Not Applicable.			
(U)	In FY 2004: Not Applicable.			
(U)	In FY 2005: Develop and demonstrate spore, bacterial, viral, and toxin simulants with internal tracking markers, and develop the critical microbiology required for simulant testing of counterforce and neutralization concepts. Conduct sub- to full-scale testing of tracking and tracing capabilities of simulants in conjunction with breadboard agent defeat weapons tests for counterproliferation.			
(U)				
(U)	MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate Laser Eye Protection (LEP) technologies in the form of spectacles and visors for aircrew and ground personnel to provide protection from lasers while minimizing negative impacts on vision. Note: This effort includes $0.9 million in FY 2003 Congressional Add funding and $1.4 million in FY 2004 Congressional Add funding for Laser Eye Protection Research.	1.465	1.755	0.356
(U)	In FY 2003: Completed evaluation of protective performance, visual acuity impacts, life support equipment compatibility, and aircrew acceptability of next-generation LEP, designed to provide acceptable visual performance while protecting against a second laser in the visible spectrum. Developed and demonstrated LEP for air-based laser platforms and for special operations teams. Demonstrated and evaluated LEP with vision corrective prescriptions. Accelerated operational utility evaluations of prescription-capable LEP and included first response capability to 'pop-up' laser threats.			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **5020 Directed Energy Protective Systems**

(U)	In FY 2004: Begin design and development of a laser protective visor compatible with night vision goggles. Continue demonstration and evaluation of LEP for air-based laser platforms. Evaluate protective performance, visual acuity impacts, equipment compatibility, and user acceptability of LEP for special operations teams. Transition technology for vision corrective prescription Laser Eye Protection (LEP), and for wide-band, near-infrared, and two visible laser line protection. Accelerate development of LEP for Air Force Special Operations Command ground forces; finish LEP spectacles for the Airborne Laser and the Advanced Tactical Laser wavelengths and vision corrective spectacles ahead of baseline schedule.			
(U)	In FY 2005: Continue development and integration of LEP with night vision goggles. Develop hypervision technologies towards integrating with LEP. Begin development of standardized methods for evaluating effects on human visual performance of potential component technologies for future LEP devices. Begin development of an LEP visor for the Advanced Tactical Laser.			
(U)				
(U)	CONGRESSIONAL ADD: Total Atmospheric Liquefaction for Oxygen and Nitrogen (TALON).	3.399	1.388	0.000
(U)	In FY 2003: Designed, fabricated, and tested a palletized advanced technology demonstrator for on-board production of oxygen and nitrogen for airlift aircraft. Technology could increase the availability of high-purity nitrogen gas for fuel tank inerting; provide high-purity oxygen for aircrew, paratrooper, and patient life support; and reduce aircraft dependency on the costly and extensive deployment footprint of liquid oxygen. Fabricated and tested a cryocooler for liquefaction of nitrogen and oxygen from compressed air, and produced a detailed aircraft integration plan for the palletized system.			
(U)	In FY 2004: Continue development of component technologies for the palletized TALON technology demonstrator. Technology will increase the availability of high-purity nitrogen gas for fuel tank inerting; provide high-purity oxygen for aircrew, paratrooper, and patient life support; and reduce aircraft dependency on the costly and extensive deployment footprint of liquid oxygen. Fabricate full-scale oxygen and nitrogen distillation columns and integrate columns with cryocooling technologies. Continue to refine aircraft integration plans for flight-testing the palletized technology demonstrator on-board a heavy aircraft.			
(U)	In FY 2005: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Special Operations Crew Research at Brooks Air Force Base.	2.040	0.000	0.000
(U)	In FY 2003: Developed technologies to counter warfighter fatigue, identify and neutralize biological agents, and reduce casualties and attrition in special operations training and operations.			
(U)	In FY 2004: Not Applicable.			
(U)	In FY 2005: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Crew Systems Personnel Protection.	0.000	1.785	0.000

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603231F Crew Systems and Personnel Protection Technology**	PROJECT NUMBER AND TITLE **5020 Directed Energy Protective Systems**

(U) In FY 2003: Not Applicable.

(U) In FY 2004: Develop and demonstrate technologies and tailor guidelines to improve warfighter performance for Special Operations Forces.

(U) In FY 2005: Not Applicable.

(U) Total Cost	8.916	7.383	3.885

(U) C. Other Program Funding Summary ($ in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
(U) PE 0602102F, Materials.									
(U) PE 0602202F, Human Effectiveness Applied Research.									
(U) PE 0603112F, Advanced Materials for Weapon Systems.									
(U) PE 0603319F, Airborne Laser Program.									
(U) PE 0604706F, Life Support Systems.									

(U) D. Acquisition Strategy

Not Applicable.