PE NUMBER: 0602201F
PE TITLE: Aerospace Vehicle Technologies

Exhibit R-2, RDT&E Budget Item Justification

DATE: February 2004

BUDGET ACTIVITY: 02 Applied Research

PE NUMBER AND TITLE: 0602201F Aerospace Vehicle 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
	Total Program Element (PE) Cost	75.067	64.311	74.679	103.895	111.893	105.771	108.164	Continuing	TBD
2401	Structures	26.267	28.679	32.831	43.196	46.599	41.726	42.646	Continuing	TBD
2403	Flight Controls and Pilot-Vehicle Interface	16.777	15.486	16.643	30.324	33.315	28.784	29.589	Continuing	TBD
2404	Aeromechanics and Integration	32.023	20.146	25.205	30.375	31.979	35.261	35.929	Continuing	TBD
4397	Air Base Technology	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	TBD

Note: In FY 2003, only the space unique efforts in Project 2403 transferred to PE 0602500F, Project 5030, in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description and Budget Item Justification

This program investigates, develops, and analyzes aerospace vehicle technologies in the three primary areas of structures, controls, and aeromechanics. First, advanced structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Second, flight control technologies are developed and simulated for both manned and unmanned aerospace vehicles. Third, the aeromechanics of advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multidisciplinary analysis. Resulting technologies reduce life cycle costs and improve the performance of existing and future manned and unmanned aerospace vehicles. Note: In FY 2004, Congress added $1.1 million for intelligent flight control simulation research laboratory.

This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary aerospace vehicle technologies.

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

		FY 2003	FY 2004	FY 2005
(U)	Previous President's Budget	76.347	65.662	77.571
(U)	Current PBR/President's Budget	75.067	64.311	74.679
(U)	Total Adjustments	-1.280	-1.351	
(U)	Congressional Program Reductions		-2.000	
	Congressional Rescissions		-0.551	
	Congressional Increases		1.200	
	Reprogrammings			
	SBIR/STTR Transfer	-1.280		
(U)	Significant Program Changes:			
	None			

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 02 Applied Research	PE NUMBER AND TITLE: 0602201F Aerospace Vehicle Technologies	PROJECT NUMBER AND TITLE: 2401 Structures	

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
2401 Structures	26.267	28.679	32.831	43.196	46.599	41.726	42.646	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 advanced structures concepts to exploit new materials and fabrication processes and investigates new structural concepts and design techniques. Resulting technologies strengthen and extend the life of current and future manned and unmanned aerospace vehicle structures. Payoffs to the warfighter include reduced weight and cost, as well as improved operability and maintainability of aerospace vehicles.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop an economic service life analysis capability comprised of analysis tools, methodologies, and monitoring schemes.	7.880	7.170	6.332
(U) In FY 2003: Developed economic service life analysis for current and future aircraft, enhancing capability, component replacement, and technology direction. Continued development of unitized structural concepts and multidisciplinary optimization methodologies that enhance affordability and decrease vulnerability for current and future aerospace vehicles. Incorporated newly developed analysis tools into life prediction and failure analysis software.			
(U) In FY 2004: Develop economic service life analysis and structural design tools for current and future aircraft, enhancing capabilities, component replacement, and technology direction. Continue the development of unitized structural concepts and multidisciplinary methodologies that enhance affordability and decrease vulnerability for current and future aerospace vehicles. Incorporate newly developed analysis tools into life prediction and failure analysis. Complete reliability based design tools for advanced aircraft components and concepts.			
(U) In FY 2005: Develop alternative methodologies and concepts for structural repair. Develop structural health monitoring schemes for structures susceptible to damage. Pursue additional aspects of the development of economic service life analysis and structural design tools for current and future aircraft enhancing capabilities, component replacement, and technology direction. Incorporate newly developed analysis tools for life prediction and failure analysis. Continue to develop failure criteria tools for advanced high temperature aircraft components and concepts. Complete the development of unitized structural concepts and multidisciplinary methodologies that enhance affordability and decrease vulnerability for current and future aerospace vehicles.			
(U)			
(U) MAJOR THRUST: Develop methodologies to allow for analytical air-worthiness certification that will reduce the cost and time involved in actual full-scale testing of components and aircraft prior to obtaining air-worthiness certification.	4.203	7.743	6.550

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2401 Structures**

(U) In FY 2003: Developed analytical certification methodologies for the incorporation of advanced methods, concepts, and manufacturing technologies into legacy aircraft components and future vehicle designs. Improved the air-worthiness certification process for aircraft subjected to dynamic aeroelastic loads with high fidelity models.			
(U) In FY 2004: Develop analytical certification methodologies for the incorporation of advanced methods, concepts, diagnostic techniques, and manufacturing technologies into legacy aircraft components and airframe design. Improve the air-worthiness certification process for aircraft subject to dynamics laods and with high fidelity.			
(U) In FY 2005: Continue to develop analytical certification methodologies for the incorporation of advanced methods, concepts, diagnostic techniques, and manufacturing technologies into legacy aircraft components and airframe design. Improve air-worthiness certification process for aircraft subject to dynamic loads and with high fidelity.			
(U)			
(U) MAJOR THRUST: Develop design methods to capitalize on new materials and integration of various subsystem hardware items (e.g., antennas and sensors) into the actual aircraft structures and/or skin of the aircraft.	2.101	5.736	5.424
(U) In FY 2003: Continued development of structural concepts, design, analysis methods that enable the integration of structure with other airframe functions to reduce cost and increase the survivability of future systems. Concepts included adaptive structures for varying moldline, subsystems hardware, and antennae contained within the load bearing structure.			
(U) In FY 2004: Develop concepts, design, and analysis methods and components that enable the integration of structures with other air vehicle functions to reduce cost and weight, as well as increase the survivability of future systems. Continue the development of concepts that include adaptive structures, subsystem hardware, and antenna integration into a load-bearing structure to create multifunction or ultra lightweight concepts.			
(U) In FY 2005: Refine concepts, design and analysis methods, and components that enable the integration of structures with other air vehicle functions to reduce cost and weight, as well as increase the survivability of future systems. Continue the development of concepts that include adaptive structures, subsystem hardware, and antenna integration into a load-bearing structure to create multifunction or ultra lightweight concepts.			
(U)			
(U) MAJOR THRUST: Develop technologies that will permit the structural development of aircraft that can operate at an extreme altitude while at sustained speeds greater than Mach 2.	12.083	8.030	14.525
(U) In FY 2003: Developed technologies that incorporated advanced materials as well as passive and active cooling to withstand extreme flight environments. Concepts included advanced, durable, all-weather thermal protection systems, attachment techniques, vehicle health monitoring and health management, integrated thermal protection systems, hot primary structures, hybrid structures, unitized structures, joining concepts, and cryogenic/non-cryogenic tank structures.			
(U) In FY 2004: Develop technologies that incorporate advanced materials, as well as passive and active cooling to withstand extreme flight environments. Complete the development of assessment methodologies for air vehicle			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2401 Structures**

assessment.

(U) In FY 2005: Continue to develop technologies that incorporate advanced materials, and design concepts for the creation of an integrated air vehicle structure that can withstand extreme flight environments. Continue the development of concepts germane to advanced, all-weather, durable, thermal protection systems; attachment techniques; vehicle health monitoring; hot primary structures; hybrid structures; joining concepts; and tanks.

(U) Total Cost	26.267	28.679	32.831

(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 0602102F, Materials.									
(U) PE 0603112F, Advanced Materials for Weapon Systems.									
(U) PE 0603211F, Aerospace Technology Dev/Demo.									
(U) PE 0603333F, Unmanned Air Vehicle Dev/Demo.									
(U) PE 0604105F, Next Generation Bomber.									
(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: 02 Applied Research	PE NUMBER AND TITLE: 0602201F Aerospace Vehicle Technologies	PROJECT NUMBER AND TITLE: 2403 Flight Controls and Pilot-Vehicle Interface	

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
2403	Flight Controls and Pilot-Vehicle Interface	16.777	15.486	16.643	30.324	33.315	28.784	29.589	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

Note: In FY 2003, the space unique tasks in Project 2403 will be transferred to PE 0602500F, Project 5030, in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description and Budget Item Justification

This project develops technologies that enable maximum affordable capability from manned and unmanned aerospace vehicles. Advanced flight control technologies are developed for maximum vehicle performance throughout the flight envelope and simulated in virtual environments. Resulting technologies contribute significantly towards the development of reliable autonomous unmanned air vehicles, space access systems with aircraft-like operations, and extended-life legacy aircraft. Payoffs to the warfighter include enhanced mission effectiveness, optimized flight safety, increased survivability, improved maintenance, and decreased size, weight, and cost. Leverages a network of synthetic environments for evaluation of advanced concepts.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop advanced flight control systems, components, and integrated vehicle health monitoring systems for both manned and unmanned aircraft. In addition to increased reliability, efforts will also focus on reducing the size, weight, and cost of control and prognostic systems.	2.852	5.718	7.177

(U) In FY 2003: Developed and assessed advanced control mechanization technologies to provide highly reliable operation for manned and unmanned systems at reduced size, weight, and cost. Demonstrated validation and verification techniques for complex, adaptive, and autonomous control software. Assessed micro-effector technologies for lightweight, long-endurance air vehicle applications. Developed real-time fault compensation using an integrated prognostic health management system.

(U) In FY 2004: Develop and assess advanced control mechanization to provide highly reliable operations for manned and unmanned systems at reduced size, weight, and cost. Continue to develop demonstrations of validation and verification techniques for complex, adaptive, and autonomous control software. Define sensing requirements for unmanned systems situational awareness in airspace operations.

(U) In FY 2005: Continue to develop and assess advanced control mechanization to provide highly reliable operations for manned and unmanned systems at reduced size, weight, and cost. Develop and assess tools and processes for the affordable validation and verification of complex, adaptive, and autonomous control software. Develop design analyses and technologies that enable analytical safety of flight certification of advanced complex control systems for applications in legacy and future air vehicles. Continue the evaluation of sensing and associated interpretation techniques for unmanned system situational awareness in airspace operations. Continue to enhance real-time fault

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2403 Flight Controls and Pilot-Vehicle Interface**

	compensation for aerospace vehicles using an integrated prognostic health management system. Initiate the development and evaluation of novel flight control effectors for distributed actuation and morphing aerospace vehicles.			
(U)				
(U)	MAJOR THRUST: Develop flight control systems that will permit safe interoperability between manned aircraft and unmanned aircraft. Concepts will also provide mission responsiveness and adaptability for improved operational effectiveness of manned and unmanned systems.	7.550	4.575	3.679
(U)	In FY 2003: Developed and assessed novel control automation techniques and algorithms to enable the safe and interoperable application of unmanned vehicle systems. Conducted feasibility assessments of automated aerial refueling system concept. Developed reliability and performance analyses of self-organizing, distributed control of multi-unmanned vehicle packages.			
(U)	In FY 2004: Continue to develop and assess novel control automation techniques and algorithms to enable safe and interoperable application of unmanned vehicle systems. Investigate feasibility of biology inspired control techniques to simplify unmanned systems autonomy implementations. Continue to enhance reliability and performance analysis of self-organizing, distributed control of multi-unmanned vehicle packages. Develop intelligent situational awareness algorithms to implement autonomous airspace operations control for unmanned vehicle systems.			
(U)	In FY 2005: Continue efforts to develop and assess novel control automation techniques and algorithms to enable safe and interoperable applications of unmanned vehicle systems. Continue to enhance reliability and performance analysis of self-organizing, distributed control of multi-unmanned vehicle flight formations. Continue development of intelligent situational awareness algorithms to implement autonomous airspace operations control for unmanned vehicle systems.			
(U)				
(U)	MAJOR THRUST: Develop tools and methods for capitalizing on simulation-based research and development of future aircraft.	5.208	4.003	5.787
(U)	In FY 2003: Assessed the value of air vehicle technologies to future aerospace systems through the development and utilization of in-house tools, systems, and processes for simulation-based research and development. Continued development of virtual simulations for unmanned air vehicles used in validating autonomous control algorithms for mixed manned and unmanned air vehicle operations. Continued to enhance simulation and analysis capabilities though incorporation of cost models to determine the affordability of new technologies. Continued development of the capability to virtually simulate future strike aircraft. Develop capability to virtually simulate space access operability.			
(U)	In FY 2004: Assess the value of air vehicle technologies to future aerospace systems through the development and utilization of in-house tools, systems and processes for simulation-based research and development. Conduct simulation assessments of advanced unmanned aerospace vehicles concepts. Continue to enhance simulation and			

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2403 Flight Controls and Pilot-Vehicle Interface**

analysis capabilities through incorporation of cost models to determine the affordability of new technologies. Continue development capability to virtually simulate future strike aircraft. Formulate and simulate concepts for future intelligence, surveillance, and reconnaissance platforms, future high-speed vehicles, advanced transports and future tankers.

(U) In FY 2005: Refine efforts to assess the value of air vehicle technologies to future aerospace systems through the development and utilization of in-house tools, systems, and processes for simulation-based research and development. Conduct simulation assessments of advanced manned and unmanned aerospace vehicles concepts. Complete the enhancement of simulation and analysis capabilities through incorporation of cost models to determine the affordability of new technologies. Complete the development of the virtual simulation environment for future strike aircraft. Continue to formulate and simulate concepts for future intelligence, surveillance, and reconnaissance platforms, future high-speed vehicles, advanced transports, and future tankers.

(U)

(U) CONGRESSIONAL ADD: Intelligent Flight Control Simulation Research.	1.167	1.190	0.000
(U) In FY 2003: Establish a distributed Intelligent Flight Control Simulation Research Laboratory capability between Wright-Patterson Air Force Base and other geographical locations.			
(U) In FY 2004: Continue Congressionally-directed effort for intelligent flight control simulation research laboratory.			
(U) In FY 2005: Not Applicable.			
(U) Total Cost	16.777	15.486	16.643

(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 0602204F, Aerospace Sensors.									
(U) PE 0603211F, Aerospace Technology Dev/Demo.									
(U) PE 0604105F, Next Generation Bomber.									
(U) This project has been coordinated through the Reliance process to harmonize									

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY 02 Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Vehicle Technologies	PROJECT NUMBER AND TITLE 2403 Flight Controls and Pilot-Vehicle Interface

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

efforts and eliminate
duplication.

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification			DATE: February 2004
BUDGET ACTIVITY: 02 Applied Research	PE NUMBER AND TITLE: 0602201F Aerospace Vehicle Technologies	PROJECT NUMBER AND TITLE: 2404 Aeromechanics and Integration	

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
2404 Aeromechanics and Integration	32.023	20.146	25.205	30.375	31.979	35.261	35.929	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 aerodynamic configurations of a broad range of revolutionary, affordable air vehicles. It matures and applies modeling and numerical simulation methods for fast and affordable aerodynamics prediction, and integrates and demonstrates multidisciplinary advances in airframe-propulsion, airframe-weapon, and air vehicle control integration. Technologies developed will greatly enhance warfighter capability in aircraft, missiles, and high-speed aerospace vehicles. The payoffs from these technology programs include lower vehicle costs (both production, and operations and support costs), increased payload and range capability, and improved supportability, safety, and survivability of aerospace vehicles.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2003	FY 2004	FY 2005
(U) MAJOR THRUST: Develop aerodynamic prediction efforts centered on expanding the design capabilities of unmanned air vehicles.	6.725	3.828	2.588

(U) In FY 2003: Developed and assessed aeronautical technologies that enable broad use of unmanned air vehicles in future missions to reduce life cycle cost and decrease human risk. Continued preliminary development of conformal inlet designs that improve airflow to engines while providing low signature for increased survivability and improved propulsion system performance. Continued development of signature compatible, high lift wings for long-duration surveillance missions.

(U) In FY 2004: Develop and assess aeronautical technologies that enable broad use of unmanned air vehicles in future missions to reduce life cycle costs and decrease human risk. Complete development of signature compatible, high lift wings for long-duration surveillance missions. Complete development of technology to improve engine nozzle design for increased survivability. Continue to perform mission assessment and develop low-cost unmanned air vehicle concept to perform tactical surveillance. Apply flow control techniques to complex air vehicle designs to achieve reduced drag and improve propulsion performance.

(U) In FY 2005: Continue efforts to develop and assess aeronautical technologies that enable broad use of unmanned air vehicles in future missions, including offensive missions, to reduce life cycle costs and decrease human risk. Continue to perform mission assessment and develop low-cost unmanned air vehicle concept to perform tactical surveillance and weapon delivery. Continue to apply flow control techniques to complex air vehicle designs to achieve reduced drag and improved propulsion system performance. Initiate research into rapid prototyping and analysis techniques to support virtual and physical models. Continue to develop technologies for improved weapon delivery and propulsion system performance in unmanned air vehicles.

(U)

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2404 Aeromechanics and Integration**

(U)	MAJOR THRUST: Develop aerodynamic prediction efforts centered on expanding the design capabilities of manned air vehicles.	7.045	2.216	0.000
(U)	In FY 2003: Developed design tools that permit quicker and more affordable certification of aerodynamic enhancements to extend the operational life of the current fleet. Continued development of analysis tools to accelerate the aerodynamic integration of new and existing weapons with current aircraft to enhance their warfighting ability. Continued to enhance computer design and analysis code that reduces the need for expensive flight-testing.			
(U)	In FY 2004: Develop design tools that permit quicker and more affordable certification of aerodynamic enhancements to extend the operational life of the current fleet. Continue enhancement of computer design and analysis code that reduces the need for expensive flight-testing, including completion of a robust unstructured mesh generation and adoption framework.			
(U)	In FY 2005: Not Applicable. Changes to this program since the previous President's Budget are due to higher Air Force priorities.			
(U)				
(U)	MAJOR THRUST: Develop new and improved concepts, designs, and analysis of technologies to enable revolutionary capabilities for sustained high-speed flight and access to space. Note: In FY 2005, access to space efforts separated into the following related thrust area to allow for increased visibility between the high-speed and access to space efforts.)	16.332	0.000	8.903
(U)	In FY 2003: Developed and assessed aerospace technologies that enable high-speed flight and low-cost access to orbit to permit global reach. Continued development of analytic methods for modeling the plasma flow field over high-speed vehicles to reduce drag. Developed experimental capability to generate and control plasma flows. Continued development of complex configurations that mitigate the extreme thermal environment under which high-speed aerospace vehicles operate. Continued development of techniques to carry and deploy weapons from aerospace vehicles flying at high speeds and high temperatures.			
(U)	In FY 2004: Not Applicable. Note: In FY 2004, the funding for this effort was decreased to support increased emphasis being placed on the National Aerospace Initiative.			
(U)	In FY 2005: Develop and assess aerospace technologies that enable sustained high-speed (greater than Mach 2) flight to permit global reach. Continue development of integrated airframe-propulsion design concepts for high-speed aerospace vehicles. Develop analytic methods for modeling the plasma flow field over high-speed vehicles to reduce drag. Complete development of techniques to carry and deploy weapons from aerospace vehicles operating at high speeds (greater than Mach 2) and high temperatures.			
(U)				
(U)	MAJOR THRUST: Develop new and improved concepts, designs, and analysis of technologies to enable revolutionary capabilities for access to space. Note: In FY 2005, the access to space efforts were previously described in the above related thrust area were broken out to allow for increased visibility between the high-speed and	0.000	0.000	7.296

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2404 Aeromechanics and Integration**

access to space efforts.

(U) In FY 2003: Not Applicable.

(U) In FY 2004: Not Applicable.

(U) In FY 2005: Develop and assess aerospace technologies that enable high-speed flight to permit aircraft-like access to space. Continue development of computational, multidisciplinary, experimental and analytical tools to simulate and control the flow fields around advanced concepts for ultra-high speed aerospace vehicles in extreme flight environments, including staging. Develop techniques to evaluate transatmospheric vehicle aerodynamic configurations to validate aero thermodynamic predictions and analysis techniques.

(U)

(U) MAJOR THRUST: Develop enabling technologies to allow integration of directed energy weapons into current and future air vehicle platforms.	1.921	9.066	4.141

(U) In FY 2003: Developed and evaluated critical aeronautical technologies to enable directed energy weapons to be carried on future air vehicles to improve combat effectiveness. Continued development of aircraft techniques to enhance energy beam transmission through the complex, turbulent aerodynamic environment surrounding aircraft enabling the use of directed energy weapons from high-speed, maneuvering aircraft.

(U) In FY 2004: Continue to develop and evaluate critical aeronautical technologies to enable directed energy weapons to be carried on future air vehicles to improve combat effectiveness. Complete development of aircraft techniques to enhance energy beam transmission through the complex, turbulent aerodynamic environment surrounding aircraft enabling the use of directed energy weapons from high-speed, maneuvering aircraft. Continue analysis of tactical utility of high-energy laser on fighter aircraft. Perform flight test measurements of the actual aero-optics effects encountered when employing a laser weapon on a fighter aircraft. Perform evaluation and demonstration of scalable technologies leading toward a high-energy laser weapon.

(U) In FY 2005: Develop and evaluate critical aeronautical technologies to enable directed energy weapons to be carried on future air vehicles, including maneuvering fighter aircraft, to improve combat effectiveness. Complete analysis of the tactical utility a high-energy laser on fighter aircraft. Continue measurements of the actual aero-optics effects encountered when employing a laser weapon on a fighter aircraft.

(U)

(U) MAJOR THRUST: Develop and assess technologies for the next generation of multi-role large aircraft.	0.000	5.036	2.277

(U) In FY 2003: Not Applicable.

(U) In FY 2004: Develop and assess aeronautical technologies to enable revolutionary re-fueling and transport aircraft designs for rapid global mobility. Develop technologies to enable multiple roles and missions for support aircraft. Complete innovative designs for re-fueling and transport aircraft to improve range and payload capacity. Complete investigation of an aerodynamic flow field behind re-fueling aircraft to improve modeling and simulation.

(U) In FY 2005: Continue efforts to develop and assess aeronautical technologies to enable revolutionary tanker and

Exhibit R-2a, RDT&E Project Justification		DATE February 2004
BUDGET ACTIVITY **02 Applied Research**	PE NUMBER AND TITLE **0602201F Aerospace Vehicle Technologies**	PROJECT NUMBER AND TITLE **2404 Aeromechanics and Integration**

transport aircraft designs for rapid global mobility, including multi-role designs. Continue to develop technologies to enable multiple roles and missions for delivery and support aircraft.

(U)	Total Cost	32.023	20.146	25.205

(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 0603211F, Aerospace Technology Dev/Demo.									
(U) PE 0604105F, Next Generation Bomber.									
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.									

(U) D. Acquisition Strategy

Not Applicable.