RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603211F Aerospace Technology Dev/Demo

	COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	22,214	29,002	73,416	31,427	28,176	28,678	229,113	629,521	Continuing	TBD
486U	Advanced Aerospace Structures	6,330	9,034	5,368	5,897	5,863	5,976	6,067	6,152	Continuing	TBD
4920	Flight Vehicle Tech Integration	15,884	19,968	25,750	25,530	22,313	22,702	223,046	623,369	Continuing	TBD
5099	National Aerospace Initiative	0	0	42,298	0	0	0	0	0	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 2002, Project 4920 contains the ongoing technical efforts from PE 0603205F, Project 2978, and PE 0603245F, Project 2568, in order to align projects with the Air Force Research Laboratory organization. In FY 2004, Project 5099 is a new project, but not a New Start. This effort supports increased emphasis being placed on the National Aerospace Initiative and ongoing hypersonics efforts. Outyear funding for the hypersonic activity will be addressed in the FY05 President's Budget Development.

(U) A. Mission Description

The demonstration and transition of advanced aerospace vehicle technologies are accomplished in this program. The three project areas are advanced aerospace structures, flight vehicle technology integration, and the National Aerospace Initiative. Advanced aerospace structures are demonstrated to sustain and enhance the capability of current and future aerospace vehicles. Flight vehicle technology integration is accomplished through system level integration of various technologies to include avionics, advanced propulsion, and weapon systems for demonstration in near-realistic operational environments. Note: In FY 2003, Congress added $3.7 million for advanced aluminum aerostructures, $0.5 million for ultra-lightweight composites, and $3.0 million for sensorcraft unmanned aerial vehicle.

(U) B. Budget Activity Justification

This program is in the Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing aerospace vehicle system upgrades and/or new system developments that have military utility and address warfighter needs.

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(U) C. Program Change Summary ($ in Thousands)

		FY 2002	FY 2003	FY 2004	Total Cost
(U)	Previous President's Budget	22,945	22,315	25,455	
(U)	Appropriated Value	23,169	29,565		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions	-224	-313		
	b. Small Business Innovative Research	-622			
	c. Omnibus or Other Above Threshold Reprogram		-250		
	d. Below Threshold Reprogram				
	e. Rescissions	-109			
(U)	Adjustments to Budget Years Since FY 2003 PBR			47,961	
(U)	Current Budget Submit/FY 2004 PBR	22,214	29,002	73,416	TBD

(U) Significant Program Changes:

Changes to this program since the previous President's Budget are due to increased funding for technologies supporting the National Aerospace Initiative. Outyear funding for the hypersonic activity will be addressed in the FY 2005 President's Budget Development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)

DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603211F Aerospace Technology Dev/Demo

PROJECT: 486U

COST ($ in Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
486U	Advanced Aerospace Structures	6,330	9,034	5,368	5,897	5,863	5,976	6,067	6,152	Continuing	TBD

(U) A. Mission Description

This project develops and demonstrates affordable aerospace vehicle technologies to sustain the existing fleet, reduce the cost of aircraft ownership, and enhance the capability of current and future aerospace vehicles. Sustainment of the existing fleet through their extended operational service life with innovative technology application will lead to reduced operations and support costs, and increased operational readiness. Analytical certification will reduce the cost associated with component replacement by allowing and certifying new designs under reduced test requirements. Development of capability enhancing technologies will expand the operational envelope and increase survivability in high threat environments. Demonstration of these technologies will restore structural integrity, extend structural life, enhance the capability, and reduce the life cycle costs of fielded aircraft.

(U) FY 2002 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$2,243	Completed the development of analysis methods to accurately predict the impact of corrosion on the onset of cracking, crack progression, and structural failure. Improved the ability to predict the effect of corrosion and corrosion treatments on structural integrity to greatly reduce instances and levels of repair/replacement.
(U)	$2,106	Continued improvement in durability and affordability of existing aging aircraft and future aerospace vehicle structures for reduced operations and support costs and to extend usable structural lives. Continued the development of technology required for full implementation of bonded repair technology.
(U)	$1,017	Developed technologies that will extend aircraft life, increase aircraft availability, and reduce operations and support costs. Concepts and methods were developed to reduce dynamic loads. This will result in the capability to cost-effectively and safely utilize aircraft longer than originally intended. It will also result in decreased maintenance actions due to damage in dynamically loaded structures.
(U)	$964	Continued Congressionally-directed efforts to accelerate development of three-dimensional woven preform composite technology to produce low weight, non-corroding structural components.
(U)	$6,330	Total

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BUDGET ACTIVITY 03 - Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603211F Aerospace Technology Dev/Demo	PROJECT 486U

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$2,165	Continue improvements in sustainment technologies for existing aging aircraft and future aerospace vehicle structures for reduced operations and support costs and to extend usable structural lives. Continue the development of technology required for full implementation of bonded composite repair of thick and complex structures. Continue development of new analytical methods and techniques to expand bonded composite repair capabilities to thick and complex geometry structures enabling repair in lieu of replacement of primary load carrying structural components.
(U)	$2,665	Develop innovative and new non-traditional sustainment technologies that will extend aircraft life, increase aircraft availability, and reduce operational and support costs. Continue development of unitized composite structures to replace mechanically fastened built up components that are highly susceptible to damage from dynamic in-service usage resulting in elimination of maintenance actions due to loose fasteners and fastener hole damage.
(U)	$3,710	Initiate Congressionally-directed effort for advanced aluminum aerostructures.
(U)	$494	Initiate Congressionally-directed effort for ultra-lightweight composites.
(U)	$9,034	Total

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$2,111	Develop improvements in sustainment technologies for existing aging aircraft and future air vehicle structures for reduced operations and support costs and to extend the usable structural lives. Continue the development of new analytical methods and techniques to expand bonded composite repair capability to thick and complex geometry structures enabling repair in lieu of replacement of the primary load carrying structural components.
(U)	$3,257	Develop innovative and new non-traditional sustainment technologies that will extend aircraft life, increase aircraft availability, and reduce operations and support costs. Complete development of unitized composite structure concepts for repair or replacement of mechanically fastened built up components that are highly susceptible to loose fasteners and fastener hole damage from dynamic in-service usage, thereby providing a significant reduction in maintenance actions.
(U)	$5,368	Total

(U) B. Project Change Summary

Not Applicable.

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BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603211F Aerospace Technology Dev/Demo
PROJECT: 486U	

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

(U) Related Activities:

(U) PE 0602201F, Aerospace Vehicle Technologies.

(U) PE 0603333F, Unmanned Air Vehicle Dev/Demo.

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

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)

DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603211F Aerospace Technology Dev/Demo

PROJECT: 4920

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
4920 Flight Vehicle Tech Integration	15,884	19,968	25,750	25,530	22,313	22,702	223,046	623,369	Continuing	TBD

Note: Beginning in FY 2002, this project contains the ongoing technical efforts from PE 0603205F, Project 2978, and PE 0603245F, Project 2568, in order to align projects with the Air Force Research Laboratory organization.

(U) A. Mission Description

This project integrates and demonstrates advanced flight vehicle technologies that will improve the performance and supportability of existing and future manned and unmanned aerospace vehicles. System level integration brings together the aerospace vehicle technologies along with avionics, propulsion, and weapon systems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational aircraft. This program provides proven aerospace vehicle technologies for all-weather, day/night operations with significantly improved performance and affordability.

(U) FY 2002 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $3,901 Developed and validated novel control automation techniques and algorithms to enable the safe and interoperable application of unmanned vehicle systems while providing mission responsiveness and adaptability for improved operational effectiveness of manned and unmanned systems. Completed the simulation assessment of intelligent-agent-based algorithms and modular software system architecture for cooperative control of unmanned vehicles. Integrated unmanned vehicle software with photonic vehicle management system hardware.

(U) $803 Demonstrated and validated advanced control mechanization technologies to provide highly reliable operation for manned and unmanned systems at significantly reduced size, weight, and cost. Completed advanced development and demonstration of direct optical control and interfacing of vehicle management and more-electric subsystems. Transferred technology to unmanned air vehicle control integration efforts. Assessed benefits of applying photonic technologies to vehicle and health management for military space access systems.

(U) $1,439 Developed multi-functional integrated structures to reduce acquisition and support costs, weight, and volume. Developed concepts for embedding high frequency multi-element antenna arrays in load bearing structures for antenna performance improvement. Matured concepts with advanced aerodynamic technologies that enable structurally integrated highly survivable and maintainable inlet and exhaust systems.

(U) $1,600 Demonstrated new analysis methods and design criteria for advanced composite structures to reduce life cycle costs of current and future aerospace vehicles by maximizing the use of composite structures. Developed design concepts and methods to allow a more widespread use of low-cost bonded structures with particular attention to verification of analysis methods through test articles.

(U) $416 Developed advanced structural concepts and design methods for future aerospace vehicles for enhanced affordability and higher performance.

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(U) A. Mission Description Continued

(U) FY 2002 ($ in Thousands) Continued

Completed flight test demonstration of the increased control authority of an active aeroelastic wing, and transitional technology to reduce airframe cost and weight for future air vehicles.

(U) $1,387 Initiated Congressionally-directed efforts to establish an Access-to-Space Joint System Program Office.

(U) $4,853 Initiated Congressionally-directed efforts with Aeronautical Systems Center.

(U) $1,485 Initiated Congressionally-directed efforts for affordable combat avionics initiatives.

(U) $15,884 Total

(U) FY 2003 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $4,942 Develop and demonstrate key control automation techniques and algorithms to enable the safe and interoperable application of unmanned aerial vehicle systems. Continue to develop and demonstrate hardware and algorithms for automated air collision avoidance. Flight demonstrate intelligent agent-based algorithms and modular software system architecture for cooperative control of unmanned aerospace vehicles systems.

(U) $4,193 Develop an integrated control technology suite to provide significantly increased reliability and mission effectiveness for air vehicle systems. Complete baseline systems architecture by combining compact, low-cost hardware with adaptive, fault tolerant inner-loop control and autonomous, trajectory-generating outer-loop control. Develop, test, and verify component technologies for systems integration.

(U) $362 Demonstrate and validate advanced control mechanization technologies to provide highly reliable operations for manned and unmanned systems at a significantly reduced size, weight, and cost. Complete advanced development and demonstration of direct optical control and interfacing of vehicle management and more-electric subsystems.

(U) $1,886 Develop multi-functional integrated structures to reduce acquisition costs, support costs, weight, and volume while increasing the performance of air vehicles. Continue development of concepts with embedded high frequency multi-element antenna arrays in load bearing structures to enable increased antenna performance and new capabilities at reduced cost, weight, and volume. Develop highly efficient and durable multifunction structures with embedded electrical conductors and data cabling, health monitoring networks, fuel handling and sensing, and thermal management in order to minimize vehicle weight, volume, and acquisition and support costs.

(U) $1,997 Develop integral airframe technologies to enable increased propulsion system performance. Complete demonstration of inlet duct concepts with advanced aerodynamic technologies that enable structural integration, enhanced performance, survivability, and increased propulsion system performance. Develop conformal inlet concepts with advanced aerodynamic technologies that enable higher efficiency propulsion systems.

(U) $2,106 Develop advanced structural concepts and design methods to significantly enhance the affordability and increase the performance of current and future aerospace vehicles. Continue development of new analysis methods, design concepts, and design criteria to enable low-cost unitized

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PROJECT 4920	

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

composite structures. Continue development of demonstration articles for test verification of analyses methods, design concepts, and design criteria.

(U) $1,514 Develop affordable advanced aero-structural concepts and design methods to enable new performance capabilities for future aerospace vehicles. Continue flight test demonstration of the increased high-speed control authority of an active aeroelastic wing. Develop concepts applying continuous moldline technologies to reduce aerodynamic drag and electromagnetic signature for reconfigurable structures to enable maximum warfighting capability and versatility in a single platform. Develop highly efficient wing concepts integrating active aeroelastic design concepts, adaptive structures, and aerodynamic flow control technologies to enable new capabilities for long-range air vehicles and long endurance vehicles.

(U) $2,968 Initiate Congressionally-directed effort for sensorcraft unmanned aerial vehicle.

(U) $19,968 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $13,116 Develop and demonstrate key automation techniques and flight control algorithms to enable the safe and interoperable application of unmanned and manned air vehicle systems. Continue development of an integrated flight control technology suite that combines compact, low-cost hardware with adaptive, fault tolerant inner-loop control and autonomous, trajectory-generating outer-loop control to provide significantly increased reliability and mission effectiveness for unmanned air vehicle systems. Develop and demonstrate control component technologies for systems integration. Develop automated aerial refueling algorithms and system design concepts for manned and unmanned air vehicle refueling in flight.

(U) $2,474 Develop advanced aerodynamic/structural integration concepts that enable increased system performance at a reduced cost. Continue development and demonstration of system hardware for an actively controlled conformal inlet system, enabling increased installed propulsion system performance at a reduced weight and size. Develop and demonstrate active flow control devices to significantly increase and enhance the separation envelope for small diameter munitions and to reduce weapon bay acoustics to minimize damage susceptibility of sensitive subsystem electronics.

(U) $2,360 Develop advanced structural concepts and design methods for future air vehicle airframes for enhanced affordability and higher performance. Complete demonstration of advanced low-cost bonded composite structure concepts enabled by new analysis, manufacturing, and assembly processes which will reduce life cycle costs of current and future air vehicles by maximizing the use of composite structures. Develop approaches to reliably use virtual and analytical methods to reduce the need for physical testing in the certification of structural components.

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	PROJECT: 4920

(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

(U)	$3,368	Develop multi-functional integrated structures to reduce acquisition costs, support costs, weight, and volume, and to increase performance of air vehicles. Continue development of concepts with embedded high and low frequency multi-element antenna arrays in loadbearing structures for antenna performance improvement and reduced air vehicle weight and volume. Develop highly efficient and durable structures with embedded electrical conductors and data cabling, health monitoring networks, fuel handling and sensing, and thermal management.
(U)	$4,432	Develop advanced aero-structural concepts and design methods for enhanced affordability, higher performance, and survivability for future air vehicles. Complete flight test that demonstrates increased high-speed control authority enabled by an active aeroelastic wing. Complete demonstration of reconfigurable continuous moldline structure concepts to reduce aerodynamic drag and electromagnetic signature to enable platform adaptation as mission requirements change and thus maximize its versatility. Continue development of highly efficient wing concepts integrating active aeroelastic design concepts, adaptive structures, and aerodynamic flow control technologies for long-range and long endurance air vehicle concepts.
(U)	$25,750	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0602201F, Aerospace Vehicle Technologies.
(U) PE 0603333F, Unmanned Air Vehicle Dev/Demo.
(U) PE 0604731F, Unmanned Combat Air Vehicle.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.

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DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603211F Aerospace Technology Dev/Demo

PROJECT: 5099

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5099 National Aerospace Initiative	0	0	42,298	0	0	0	0	0	Continuing	TBD

Note: In FY 2004, Project 5099 is a new project, but not a New Start. This effort supports increased emphasis being placed on the National Aerospace Initiative and ongoing hypersonics efforts. Outyear funding for the hypersonic activity will be addressed in the FY05 President's Budget Development.

(U) A. Mission Description

This project develops, integrates, and demonstrates flight capbilities from Mn 0 - 7 as identified in the National Aerospace Initiative (NAI). Enabling technologies include thermal protection, structures, air vehicle subsystems, flight controls, advanced propulsion systems, configurations aero-thermo dynamics, and wind tunnel testing. These and other critical technologies will be integrated into ground and flight demonstration vehicles that will validate the technologies or operation concepts, such as responsive, reliable, and cost effective 'aircraft-like' operability. Key payoffs include global reach, global strike, and space access.

(U) FY 2002 ($ in Thousands)

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 No Activity

(U) $0 Total

(U) FY 2004 ($ in Thousands)

(U) $17,333 Working with NASA under the NAI, jointly develop advanced aerospace vehicle concepts and design methods focused on a flight demonstration of Mn 0.7-7 capability that permits global reach and space access for enhanced affordability and operability, higher performance, and survivability. Develop concepts for integration of low-speed and advanced propulsion systems. Develop and characterize critical aerothermodynamic environments and flight trajectories. Develop approaches for high-speed vehicle and payload separation. Develop approaches to integrate aero sciences technologies with structures, flight controls and advanced propulsion systems to ensure successful demonstrations of supersonic/hypersonic air platforms.

(U) $11,985 Develop concepts for multifunctional integrated thermal structures and advanced thermal protection systems to reduce acquisition and support costs, weight, and volume and to increase performance of supersonic/hypersonic air vehicles. Develop lightweight long life tanks and efficient vehicle integration concepts for increased performance. Demonstrate advanced, low-cost structure concepts enabled by new analysis, manufacturing, and assembly processes, which will reduce life cycle costs of future supersonic/hypersonic air vehicles. Develop approaches

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PROJECT 5099	

(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

required to integrate structure technologies with aero-sciences, flight controls, and advanced propulsion systems.

(U) $12,980 Develop key guidance, navigation, and control automation techniques and algorithms as well as vehicle management systems that will enable the safe and interoperable application of supersonic/hypersonic air vehicles. Develop an integrated control technology suite combining compact, low cost hardware with adaptive, fault tolerant controls. Develop an integrated vehicle management and health/maintenance management system to reduce life cycle costs and increase reliability. Develop vehicle subsystems, flight controls, and power systems component technologies for systems integration. Develop approaches to integrate flight controls technologies with aero-sciences, structures and advanced propulsion to ensure successful demonstrations.

(U) $42,298 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:

(U) PE 0602201F, Aerospace Vehicle Technologies.

(U) PE 0602203F, Aerospace Propulsion.

(U) PE 0603216F, Aerospace Propulsion and Power Technology.

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

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.