

UNCLASSIFIED

PE NUMBER: 0603211F

PE TITLE: Aerospace Technology Dev/Demo

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603211F Aerospace Technology Dev/Demo
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Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	38.753	36.286	64.922	56.345	111.088	94.320	95.946	114.256	Continuing	TBD
486U Advanced Aerospace Structures	9.226	7.372	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	TBD
4920 Flight Vehicle Tech Integration	29.527	26.125	64.922	56.345	111.088	94.320	95.946	114.256	Continuing	TBD
99SP Advanced Structures Space Vehicles	0.000	2.789	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	TBD

Note: In FY 2006, efforts from Project 486U transferred into Project 4920 within this PE. Funds for the FY 2006 Congressionally-directed Design Manual for Titanium Honeycomb Sandwich Composite in the amount of \$3.253 million were moved to PE 0603211F, Aerospace Technology Dev/Demo from PE 0603112F, Advanced Materials for Weapon Systems, for execution. In FY 2007, Project 6399SP, Advanced Structures for Space Vehicles, efforts were transferred from PE 0603500F, Multidisciplinary Advanced Space Technology, Project 635062, Advanced Structures for Space Vehicles, order to effectively manage and provide oversight of the efforts. Funds for the FY 2007 Congressionally-directed Short Take Off and Landing Herk 1 Continuation in the amount of \$1.594 were moved into PE 0603211F, Aerospace Technology Dev/Demo, from PE 0401115F, C-130 Airlift Squadron, for execution.

(U) A. Mission Description and Budget Item Justification

This program demonstrates advanced aerospace vehicle technologies. Advanced aerospace structures are demonstrated to sustain and enhance the capability of current and future aerospace vehicles, such as a next generation bomber. Flight vehicle technology integration is accomplished through integration of various technologies to include avionics, advanced propulsion, and weapon systems for demonstration in near-realistic operational environments. Note: In FY 2007, Congress added \$1.0 million for 3-D Woven/Braided Composites, \$1.0 million for the Advanced Aerospace Titanium Structures (AATS) Initiative, \$1.0 million for the Advanced Aluminum Aerostructures Initiative (A3I), \$1.3 million for Large Composite Affordable Composite Structures, \$1.7 million for the National Capabilities Analysis Collaborative, Phase 3, \$1.1 million for Titanium Honeycomb Sandwich and Composite Structures, and \$1.6 million for Short Take Off and Landing (STOL) Herk 1 Continuation. 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) **B. Program Change Summary (\$ in Millions)**

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Previous President's Budget	53.657	27.424	57.925	114.655
(U) Current PBR/President's Budget	38.753	36.286	64.922	56.345
(U) Total Adjustments	-14.904			
(U) Congressional Program Reductions				
Congressional Rescissions	0.280	-0.138		
Congressional Increases		31.100		
Reprogrammings	-14.327	-22.100		
SBIR/STTR Transfer	-0.857			

(U) **Significant Program Changes:**

FY 2006 changes are the result of moving Congressionally-directed efforts from this PE to the proper PEs for execution and increased emphasis being placed on improving lift and performance capability of manned and unmanned platforms in Project 4920 within this PE.

FY 2007 changes are the result of moving Congressionally-directed efforts from this PE to the proper PEs for execution.

(U) C. Performance Metrics
Under Development

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)					PE NUMBER AND TITLE 0603211F Aerospace Technology Dev/Demo			PROJECT NUMBER AND TITLE 486U Advanced Aerospace Structures		
Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
486U Advanced Aerospace Structures	9.226	7.372	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0		

Note: In FY 2006, efforts from Project 486U transfer into Project 4920 within this PE.

(U) A. Mission Description and Budget Item Justification

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 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) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) CONGRESSIONAL ADD: Design Manual for Titanium Honeycomb Sandwich Composite Structure.	3.172	1.096	0.000	0.000
(U) In FY 2006: Initiated Congressionally-directed effort for design manual for titanium honeycomb sandwich composite structure.				
(U) In FY 2007: Continued Congressionally-directed effort for design manual for titanium honeycomb sandwich composite structure.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Fly-By-Light.	2.018	0.000	0.000	0.000
(U) In FY 2006: Continued Congressionally-directed effort for fly-by-light.				
(U) In FY 2007: Not Applicable.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Wright Brothers Institute - Capabilities Analysis Phase 2.	4.036	1.694	0.000	0.000
(U) In FY 2006: Continued Congressionally-directed effort for capabilities planning support.				
(U) In FY 2007: Continued Congressionally-directed effort for capabilities planning support.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				

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(U) B. Accomplishments/Planned Program (\$ in Millions)	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U)				
(U) CONGRESSIONAL ADD: 3-D Woven/Braided Composites	0.000	0.996	0.000	0.000
(U) In FY 2006: Not Applicable				
(U) In FY 2007: Initiated Congressionally-directed effort for 3-D woven/braided composites.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U)				
(U) CONGRESSIONAL ADD: Advanced Aerospace Titanium Structures (AATS) Initiative.	0.000	0.996	0.000	0.000
(U) In FY 2006: Not Applicable				
(U) In FY 2007: Initiated Congressionally-directed AATS effort.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U)				
(U) CONGRESSIONAL ADD: Advanced Aluminum Aerostructures (A3I) Initiative.	0.000	1.295	0.000	0.000
(U) In FY 2006: Not Applicable				
(U) In FY 2007: Continued Congressionally-directed A3I effort, last funded by Congress in FY 2005.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U)				
(U) CONGRESSIONAL ADD: Large Scale Affordable Composite Structures	0.000	1.295	0.000	0.000
(U) In FY 2006: Not Applicable				
(U) In FY 2007: Initiated Congressionally-directed effort for large-scale affordable composite structures.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U)				
(U) Total Cost	9.226	7.372	0.000	0.000

(U) C. Other Program Funding Summary (\$ in Millions)	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Complete</u>							

(U) Related Activities:
(U) PE 0602201F, Aerospace

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486U Advanced Aerospace
Structures(U) **C. Other Program Funding Summary (\$ in Millions)**

Vehicle Technologies.

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

(U) **D. Acquisition Strategy**

Not Applicable.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)					PE NUMBER AND TITLE 0603211F Aerospace Technology Dev/Demo			PROJECT NUMBER AND TITLE 4920 Flight Vehicle Tech Integration		
Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
4920 Flight Vehicle Tech Integration	29.527	26.125	64.922	56.345	111.088	94.320	95.946	114.256	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0		

Note: In FY 2006, efforts from Project 486U transferred into Project 4920 within this PE.

(U) A. Mission Description and Budget Item Justification

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 improved performance and affordability.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Develop autonomous flight controls for safe flight and cooperative operations between manned and unmanned air platforms. Note: The FY 2009 increase in funding is due to the demonstration efforts related to automated situational awareness for unmanned air systems.	7.601	5.239	6.379	14.411
(U) In FY 2006: Completed hardware-in-the-loop simulation assessments of integrated, adaptive, fault tolerant, autonomous control system suite to verify significantly increased reliability and mission effectiveness for unmanned vehicle systems. Completed environmental testing of key photonic sensing and control elements for flight critical control. Prepared key photonic sensing and control elements for flight-testing. Flight demonstrated automated see and avoid capability for unmanned air vehicles.				
(U) In FY 2007: Complete ground simulation and flight demonstration of key hardware and software systems for adaptive, fault tolerant, autonomous unmanned air vehicle airborne control. Initiate development of situational awareness and control technologies for automated air base ground operations for unmanned air vehicles.				
(U) In FY 2008: Further develop situational awareness and control technologies for automated air base ground operations for unmanned air vehicles. Incorporate electromagnetic threat tolerant control systems technologies for air base ground operations for unmanned air vehicles.				
(U) In FY 2009: Conduct ground demonstrations of situational awareness and control technologies for automated air base ground operations for unmanned air vehicles. Develop and demonstrate cooperative teaming of small unmanned air vehicles in complex, low altitude environments. Conduct evaluation of validation and verification tools and process for affordable certification of autonomous unmanned air vehicle flight control software. Refine development efforts for electromagnetic threat tolerant control				

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NUMBER AND TITLE			
03 Advanced Technology Development (ATD)	0603211F Aerospace Technology Dev/Demo	4920 Flight Vehicle Tech Integration			
(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>		<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
systems technologies for air base ground operations for unmanned air vehicles.					
(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop, simulate, and demonstrate integrated technologies to improve the performance of manned and unmanned platforms. Note: The FY 2007, decrease is due to completion of a majority of the thrust objectives in FY 2006. In FY 2008, increased emphasis being placed on demonstration efforts related to the composite affordability initiative.		10.388	3.037	41.349	17.342
(U) In FY 2006: Completed initial demonstration of an actively controlled conformal inlet system for increased propulsion system performance for unmanned air vehicles. Continued demonstration of active flow control devices to significantly increase and expand the separation envelope for miniature munitions and reduce weapon bay acoustics to minimize damage to the aircraft at speeds in excess of Mach 1. Initiated Short Take Off and Landing (STOL) Herk 1 efforts to improve lift and performance capability of the AC-130 gunships.					
(U) In FY 2007: Continue development of a simulation environment to enable evaluation of network centric technologies for improved capabilities for high speed operational concepts. Continue Congressionally-directed efforts for STOL Herk 1.					
(U) In FY 2008: Conduct flight demonstration of extensive laminar flow on swept wing test article. Complete wind tunnel testing of gust load alleviation and body freedom flutter suppression of high altitude, long endurance platforms. Complete integration of data streams and analysis tools; graphical user interfaces; database/model updates; validation of model and selection criteria; and identification of model correction factors. Develop and integrate aircraft components that capitalize upon unitized advanced materials that are lightweight and affordable into an X-type cargo aircraft. Develop approaches that would reduce the tooling required to fabricate aircraft components. Begin flight demonstration efforts for an X-type cargo aircraft.					
(U) In FY 2009: Complete flight demonstration of extensive laminar flow on swept wing test article. Conduct and complete flight demonstration of an X-type aircraft comprised of advanced materials for weight reduction, surface smoothness, corrosion, and fatigue elimination.					
(U) MAJOR THRUST: Develop analytical certification methods and capability to reduce the need for physical testing in the certification of structural components resulting in reduced acquisition cost for new systems and reduced support costs for future and legacy systems. Demonstrate reduced support costs for future systems by incorporation of advanced monitoring capabilities. Note: In FY 2008, the		3.475	8.614	0.000	0.000

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<u>(U) B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
demonstration efforts real-time diagnostic and prognostics health monitoring demonstration efforts are being suspended because of the need for additional Applied Research efforts.				
(U) In FY 2006: Continued development and initiated demonstration of improved sustainment technologies for existing aging aircraft and future aerospace vehicle structures to reduce operations and support costs and extend usable structural lives. Continued development and initiated demonstration of real-time diagnostic and prognostics health monitoring tools for thermal protected systems, tanks, structures, and subsystems to enable rapid turn around and high temperature operations of high-speed aircraft.				
(U) In FY 2007: Continue demonstration of improved sustainment technologies for existing aging aircraft and future aerospace vehicle structures to reduce operations and support costs and extend usable structural lives. Continue demonstration of real-time diagnostic and prognostics health monitoring tools for thermal protected systems, tanks, structures, and subsystems to enable rapid turn around and high temperature operations.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) MAJOR THRUST: Develop aircraft structures that have embedded components, which have previously been separate components that were attached to the air platforms. Note: The FY 2008 and out year increase in funding is due to the demonstration efforts related to flight testing of large X band antenna embedded in a load bearing structure.	4.378	6.170	14.125	20.766
(U) In FY 2006: Continued development of multi-functional integrated structures to reduce acquisition and support costs, weight, and volume and increase performance of air vehicles. Initiated flight demonstration of concepts with high multi-element antenna arrays embedded in load-bearing structure to increase antenna performance improvement and reduced vehicle weight, cost, and volume. Continued development and initiated demonstration of concepts for very large, low frequency antenna arrays embedded in the aircraft load-bearing structure to enable new antenna capabilities and increased performance, while reducing vehicle weight, cost, and volume.				
(U) In FY 2007: Continue and assess results from flight demonstration of concepts with high multi-element antenna arrays embedded in load-bearing structure to increase antenna performance improvement and reduced vehicle weight, cost, and volume. Continue demonstration of concepts for very large, low frequency antenna arrays embedded in load-bearing structure to enable new antenna capabilities and increased performance, while reducing vehicle weight, cost, and volume.				

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(U) B. Accomplishments/Planned Program (\$ in Millions)	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2008: Complete structural demonstration of low band antenna structure. Asses and refine development of multi-functional integrated structures to reduce cost, weight, while improving performance of future air platforms. Complete fabrication and flight test a large X band electronically-scanned antenna array embedded in a load-bearing structure.				
(U) In FY 2009: Complete and assess test results from the flight demonstration of the large X band electronically scanned antenna array embedded in a load-bearing structure.				
(U) MAJOR THRUST: Develop adaptive structures to provide in-flight modifications offering improved performance over a wide range of flight conditions and mission profiles.	3.685	3.065	3.069	3.826
(U) In FY 2006: Continued development and initiated demonstration of integrated thermal airframe structures including thermal protection systems, attachments, seals, joining technologies, hot primary structure, and structural health monitoring for high-speed vehicle applications. Continued development and initiated+ demonstration of highly efficient wing concepts integrating active aero elastic design concepts, adaptive structures, and aerodynamic flow control technologies to enable viable long-range and long-endurance air vehicle concepts.				
(U) In FY 2007: Further refine integrated thermal airframe structures including thermal protection systems, attachments, seals, joining technologies, hot primary structure, and structural health monitoring for high-speed vehicle applications. Continue development and demonstration of highly efficient wing concepts integrating active aero elastic design concepts, adaptive structures, and aerodynamic flow control technologies to enable viable long range and long endurance air vehicle concepts.				
(U) In FY 2008: Develop passive and active leading edge cooling systems for ultra, high-speed vehicles. Develop and validate integration methodologies for component level leading edge test articles. Complete development and demonstration of highly efficient wing concepts integrating active aero elastic design concepts.				
(U) In FY 2009: Demonstrate passive and active thermal protection systems for leading edge components. Assess results from demonstrations of advanced efficient wings concepts integrating active aeroelastic design concepts and adaptive structures.				
(U) Total Cost	29.527	26.125	64.922	56.345

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4920 Flight Vehicle Tech Integration

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

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Complete</u>							

(U) Related Activities:

(U) PE 0602201F, Aerospace
Vehicle Technologies.

(U) PE 0604015F, 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.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603211F Aerospace Technology Dev/Demo				PROJECT NUMBER AND TITLE 99SP Advanced Structures Space Vehicles		
Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
99SP Advanced Structures Space Vehicles	0.000	2.789	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0		

Note: In FY 2007, Project 6399SP, Advanced Structures for Space Vehicles, efforts were transferred from PE 0603500F, Multidisciplinary Advanced Space Technologies, Project 635062, Advanced Structures for Space Vehicles, in order to effectively manage and provide oversight of the efforts. In FY 2008, the remaining efforts in Project 6399SP were transferred into Project 4920 within this PE, as the planned efforts were not space unique.

(U) A. Mission Description and Budget Item Justification

This project identifies, develops, and demonstrates the technologies to enable advanced access-to-space aerospace vehicles that deliver revolutionary capability, operability, responsiveness, and cost-effectiveness. Enabling technologies include thermal protection, structures, vehicle systems, configurations, aerodynamics, and controls. Technology demonstration includes multi-disciplinary system level integration of the enabling technologies.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Develop the airframe and payload technologies required to enable horizontal launch of reusable high altitude aerospace vehicles.	0.000	2.789	0.000	0.000
(U) In FY 2006: Not Applicable.				
(U) In FY 2007: Continue developing the airframe and payload technologies required to enable next generation reusable access to space systems including the thermal protection, structural, configuration, and vehicle and payload system technologies that enable aerospace vehicles to exhibit revolutionary capability, operability, responsiveness, and cost-effectiveness.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) Total Cost	0.000	2.789	0.000	0.000

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

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to Complete</u>	<u>Total Cost</u>
	Actual	Estimate								
(U) PE 0602201F, Aerospace Vehicle Technology										
(U) This project has been coordinated through the										

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**99SP Advanced Structures Space
Vehicles****(U) C. Other Program Funding Summary (\$ in Millions)**

Reliance process to harmonize
efforts and eliminate
duplication.

(U) D. Acquisition Strategy

Not Applicable.