Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Air Force										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	136.379	144.699	147.628	-	147.628	143.845	148.002	150.601	153.388	Continuing	Continuing
622401: *Structures*	43.684	44.224	47.116	-	47.116	55.322	56.898	57.885	58.938	Continuing	Continuing
622403: *Flight Controls and Pilot-Vehicle Interface*	19.568	39.283	39.295	-	39.295	37.280	38.345	39.006	39.727	Continuing	Continuing
622404: *Aeromechanics and Integration*	73.127	61.192	61.217	-	61.217	51.243	52.759	53.710	54.723	Continuing	Continuing

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. Advanced structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Flight control technologies are developed and simulated for aerospace vehicles. Advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. Resulting technologies improve performance of existing and future manned and remotely piloted air and space access vehicles. Improvements include but are not limited to reduced energy use by efficient air platform designs; use of lightweight composite structures; improved sustainment methods based upon the condition of the platform and sub-systems. Efforts in this program have been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication. 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.

B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	138.563	144.699	149.062	-	149.062
Current President's Budget	136.379	144.699	147.628	-	147.628
Total Adjustments	-2.184	-	-1.434	-	-1.434
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.189	-			
• Other Adjustments	0.005	-	-1.434	-	-1.434

Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2010**	**FY 2011**
Project: 622404: *Aeromechanics and Integration*		

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Air Force	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602201F: *Aerospace Vehicle Technologies*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2010	FY 2011
Congressional Add: *Materials Integrity Management Research for the Air Force.*	2.987	-
Congressional Add: *Unmanned Air Vehicle Sensor and Maintenance Development center.*	3.904	-
Congressional Add: *Unmanned Aerial System Exploitation.*	3.485	-
Congressional Add: *Unmanned Air Vehicle Sense, Track, and Avoid Radar.*	1.593	-
Congressional Add Subtotals for Project: 622404	11.969	-
Congressional Add Totals for all Projects	11.969	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
622401: *Structures*	43.684	44.224	47.116	-	47.116	55.322	56.898	57.885	58.938	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops advanced structures concepts to exploit new materials and fabrication processes and investigates new concepts and design techniques. New structural concepts include incorporating subsytem hardware items and adaptive mechanisms into the aerospce structures and/or skin of the platform.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1. ***Description:*** Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring schemes. ***FY 2010 Accomplishments:*** Initiated the development of health reasoners for determination of system health. Continued to incorporate newly developed analysis tools into life prediction and failure analysis. Continued to develop failure criteria tools. Developed residual stress processes to enhance service life. ***FY 2011 Plans:*** Continue the development of health reasoners for determination of system health. Incorporate newly developed analysis tools. Complete the development of failure criteria tools for advanced high temperature aircraft components and concepts. Continue the development of residual stress processes to enhance service life. ***FY 2012 Base Plans:*** Continue the development of integrated sensors for determination of system health. Incorporate newly developed analysis tools. Complete the development of failure criteria tools for advanced high temperature aircraft components and concepts. Initate efforts for condition based maintenance of structural integrity. ***FY 2012 OCO Plans:***	25.353	18.820	19.763	-	19.763
Title: Major Thrust 2. ***Description:*** Develop methodologies to reduce the cost and time involved in actual full-scale testing of components and aircraft prior to obtaining airworthiness certification. ***FY 2010 Accomplishments:***	4.043	6.432	6.897	-	6.897

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Continued development of analytical certification methodologies. Initiated the development of response prediction methodologies. ***FY 2011 Plans:*** Continue development of analytical certification methodologies that incorporate advanced methods. Initiate increased fidelity of analytical methodologies. Continue the development of reliability-based certification. ***FY 2012 Base Plans:*** Continue development of methodologies that will allow for lower cost analytical certification of advanced designed structure. Initiate the development of advanced aircraft flutter analysis tools. ***FY 2012 OCO Plans:***					
Title: Major Thrust 3. ***Description:*** Develop design methods to capitalize on new materials, multirole considerations, and integration of various subsystem hardware items and adaptive mechanisms into the actual aircraft. ***FY 2010 Accomplishments:*** Continued the development of multirole aircraft structural concepts. Continued evaluation of innovative technologies for long-range and long endurance air vehicle and micro air vehicle concepts. Continued development of multi-functional structures. ***FY 2011 Plans:*** Continue the development of technologies to increase the survivability and performance of future systems. Develop and demonstrate system level thermal management concepts to meet the need of multifunction, multirole, and adaptive aircraft. ***FY 2012 Base Plans:*** Continue the development of technologies to increase the survivability and performance of future systems. Develop and demonstrate system level thermal management concepts to meet the need of multifunction, multirole, and adaptive aircraft. ***FY 2012 OCO Plans:***	5.806	7.923	8.562	-	8.562
Title: Major Thrust 4.	8.482	11.049	11.894	-	11.894

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Description: Develop technologies that will permit the structural development of platforms that can operate at an extreme altitude, while at sustained speeds greater than Mach 2. ***FY 2010 Accomplishments:*** Developed technologies for an integrated air vehicle structure that can withstand extreme flight environments. Continued to refine operationally responsive space access concepts. ***FY 2011 Plans:*** Further develop technologies for integrated air vehicle structures that can withstand extreme flight environments. Refine operationally responsive space access concepts and apply these technologies for lower cost, reduced weight expendable vehicle airframes. ***FY 2012 Base Plans:*** Further 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 to develop structural concepts and analysis methods for design and evaluation of hot primary structure. Continue to refine operationally responsive space access concepts and apply these technologies for lower cost, reduced weight expendable vehicle airframes. ***FY 2012 OCO Plans:***					
Accomplishments/Planned Programs Subtotals	43.684	44.224	47.116	-	47.116

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622403: *Flight Controls and Pilot-Vehicle Interface*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
622403: *Flight Controls and Pilot-Vehicle Interface*	19.568	39.283	39.295	-	39.295	37.280	38.345	39.006	39.727	Continuing	Continuing

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 remotely piloted air vehicles, space access systems with aircraft-like operations, and extended-life legacy aircraft.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1. ***Description:*** Develop advanced flight control systems, components, and integrated vehicle monitoring systems for both manned and remotely piloted aircraft. ***FY 2010 Accomplishments:*** Furthered the development, assessment, and certification of advanced control mechanization technologies. Developed control configurations for small and micro-sized unmanned air systems. ***FY 2011 Plans:*** Further the development of advanced control mechanization technologies to provide highly reliable operations for aerospace systems under adverse environments. Initiate development of control architecture enhancements for complex and adaptive remotely piloted systems. ***FY 2012 Base Plans:*** Further the assessment of advanced control technologies. Refine development of control architecture enhancements for remotely piloted systems. ***FY 2012 OCO Plans:***	5.409	9.562	9.642	-	9.642
Title: Major Thrust 2. ***Description:*** Develop flight control systems that will permit safe interoperability between manned and remotely piloted aircraft. ***FY 2010 Accomplishments:***	11.069	13.664	13.808	-	13.808

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622403: *Flight Controls and Pilot-Vehicle Interface*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Continued to develop and assess novel control automation techniques and adaptive algorithms for manned and remotely piloted aircraft systems. Initiate development and assessment of cooperative control techniques of heterogeneous systems for close-in surveillance. ***FY 2011 Plans:*** Continue assessment of cooperative control techniques of heterogeneous systems for close-in surveillance. Continue technology development for the safe interoperability of multiple remotely piloted aircraft. ***FY 2012 Base Plans:*** Continue performance analysis of mixed-initiative control of multi-remotely piloted aircraft packages. Refine the development and assessment of adaptive guidance and control technologies for fault/damage tolerance and rapid flight planning of aerospace vehicle operations. ***FY 2012 OCO Plans:***					
Title: Major Thrust 3. ***Description:*** Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles. ***FY 2010 Accomplishments:*** Refined net-centric simulation environments and models to enable the quantitative and qualitative assessment of advanced aerospace vehicle concepts and technologies under realistic mission conditions. Continued technology trade studies of small and medium sized remotely piloted air vehicles in hostile urban environments. ***FY 2011 Plans:*** Refine assessment of advanced aerospace vehicle concepts and technologies under realistic mission conditions. Refine simulation analyses and multi-directorate technology trade studies on strike, transport, access-to-space, and reconnaissance concepts. ***FY 2012 Base Plans:*** Continue to conduct simulation events to evaluate emerging flight control technologies and concepts. Refine technology trade studies of remotely piloted air vehicles in manned/remotely piloted airspace and airbase operations. ***FY 2012 OCO Plans:***	3.090	16.057	15.845	-	15.845
Accomplishments/Planned Programs Subtotals	19.568	39.283	39.295	-	39.295

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622403: *Flight Controls and Pilot-Vehicle Interface*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
622404: *Aeromechanics and Integration*	73.127	61.192	61.217	-	61.217	51.243	52.759	53.710	54.723	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops aerodynamic configurations of a broad range of revolutionary, affordable aerospace vehicles. It matures and applies modeling and numerical simulation methods for fast and affordable aerodynamics prediction and integrates and demonstrates multi-disciplinary advances in airframe, propulsion, weapon, and air vehicle control integration.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Title: Major Thrust 1. ***Description:*** Develop aerodynamic prediction efforts centered on expanding the design capabilities of manned an remotely piloted air vehicles. ***FY 2010 Accomplishments:*** Performed mission assessments and develop low-cost remotely piloted air vehicle concepts to perform current and future missions including tactical surveillance and weapon delivery. Continued work to develop and demonstrate flow control to enable fluidic thrust vectoring, area control, and thermal management for a remotely piloted air vehicle exhaust nozzle. ***FY 2011 Plans:*** Continue to perform mission assessments of aerospace platforms for current and future missions including tactical surveillance and weapon delivery. Continue development of technologies for improved weapon delivery and propulsion system performance. Continue development of innovative aerodynamic control methods for small remotely piloted air vehicles. ***FY 2012 Base Plans:*** Continue to develop and assess aeronautical technologies that enable broad use of unmanned air vehicles. Continue work to develop and demonstrate flow control to enable fluidic thrust vectoring, area control, and thermal management for a remotely piloted air vehicle exhaust nozzle. Continue development of innovative aerodynamic control methods for small remotely piloted air vehicles. ***FY 2012 OCO Plans:***	2.700	3.487	3.517	-	3.517
Title: Major Thurst 2.	22.663	27.518	27.630	-	27.630

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Description: Develop new and improved concepts, designs, and analysis of technologies to enable revolutionary capabilities for sustained high-speed re-useable high altitude vehicle efforts. ***FY 2010 Accomplishments:*** Developed technologies for high-speed flight. Continued development of techniques for propulsion integration technologies. Continued to characterize high-speed phenomena and develop and validate high-speed component technologies. ***FY 2011 Plans:*** Continue development of analysis/design techniques and tools to enable shock/boundary layer interaction flow control and enhanced stability for high speed propulsion concepts. Continue efforts for high performance high speed mixed compression inlet concepts utilizing advanced flow control technologies for Mach 3+ expendable systems. Develop and test inlet variable geometry concepts. ***FY 2012 Base Plans:*** Continue development of analysis/design techniques and tools to enable shock/boundary layer interaction flow control and enhanced stability for high speed propulsion concepts. Continue efforts to characterize high-speed phenomena and develop and validate fundamental high-speed component technologies through experimental flight techniques in a relevant environment. ***FY 2012 OCO Plans:***					
Title: Major Thrust 3. ***Description:*** Develop enabling technologies to allow integration of directed energy weapons into current and future air vehicle platforms. ***FY 2010 Accomplishments:*** Continued development of combined flow control and adaptive optics systems to optimize directed energy system performance. Initiated work to apply advanced analysis tools to predict the performance of flow control and adaptive optics systems. ***FY 2011 Plans:***	2.210	2.533	2.534	-	2.534

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Continue development of combined flow control and adaptive optics systems to optimize directed energy system performance on large low-speed aircraft. Initiate development of combined flow control and adaptive optics systems for transonic/supersonic aircraft. ***FY 2012 Base Plans:*** Continue work to apply advanced analysis tools to predict the performance of flow control and adaptive optics systems for problems of interest to the Air Force. Extend development of analysis tools for prediction of advanced flow control and adaptive optics to higher speed transonic/supersonic flows. ***FY 2012 OCO Plans:***					
Title: Major Thrust 4. ***Description:*** Develop and assess technologies for the next generation of multi-role large aircraft. ***FY 2010 Accomplishments:*** Continued development and assessment of aeronautical technologies that enable revolutionary tanker and transport aircraft designs for rapid global mobility. Continued development of inlet and integration technologies for an advanced mobility platform designed to operate efficiently at transonic speeds and provide short take-off capabilities. ***FY 2011 Plans:*** Continue to develop technologies that enable multiple roles and missions for delivery and support aircraft. Conduct wind tunnel experiments to show the feasibility of mobility aircraft using 40% less energy through the use of natural and artificial laminar boundary layers, alternative fuels and very high bypass propulsion integration. ***FY 2012 Base Plans:*** Continue to develop technologies that enable multiple roles and missions for delivery and support aircraft. Conduct wind tunnel experiments to show the feasibility of mobility aircraft using 40% less energy through the use of natural and artificial laminar boundary layers, alternative fuels and very high bypass propulsion integration. ***FY 2012 OCO Plans:***	33.585	27.654	27.536	-	27.536
Accomplishments/Planned Programs Subtotals	61.158	61.192	61.217	-	61.217

Exhibit R-2A, RDT&E Project Justification: PB 2012 Air Force		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602201F: *Aerospace Vehicle Technologies*	**PROJECT** 622404: *Aeromechanics and Integration*

	FY 2010	FY 2011
Congressional Add: Materials Integrity Management Research for the Air Force. ***FY 2010 Accomplishments:*** Conducted Congressionally direct effort. ***FY 2011 Plans:***	2.987	-
Congressional Add: Unmanned Air Vehicle Sensor and Maintenance Development center. ***FY 2010 Accomplishments:*** Conducted Congressionally direct effort. ***FY 2011 Plans:***	3.904	-
Congressional Add: Unmanned Aerial System Exploitation. ***FY 2010 Accomplishments:*** Conducted Congressionally direct effort. ***FY 2011 Plans:***	3.485	-
Congressional Add: Unmanned Air Vehicle Sense, Track, and Avoid Radar. ***FY 2010 Accomplishments:*** Conducted Congressionally direct effort. ***FY 2011 Plans:***	1.593	-
Congressional Adds Subtotals	11.969	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• Activity Not Provided: *Title Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.