Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Air Force											DATE: April 2013	
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)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	145.392	120.719	119.672	-	119.672	121.849	123.393	125.530	129.925	Continuing	Continuing
622401: *Structures*	-	46.275	42.021	44.062	-	44.062	45.656	49.595	51.954	54.528	Continuing	Continuing
622403: *Flight Controls and Pilot-Vehicle Interface*	-	38.992	36.189	35.238	-	35.238	34.081	34.508	32.710	33.341	Continuing	Continuing
622404: *Aeromechanics and Integration*	-	60.125	42.509	40.372	-	40.372	42.112	39.290	40.866	42.056	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 and improved sustainment methods based on the condition of the platform and sub-systems. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee 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 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	147.628	120.719	128.975	-	128.975
Current President's Budget	145.392	120.719	119.672	-	119.672
Total Adjustments	-2.236	0.000	-9.303	-	-9.303
• Congressional General Reductions	-	0.000			
• Congressional Directed Reductions	-	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	-	0.000			
• Congressional Directed Transfers	-	0.000			
• Reprogrammings	0.399	0.000			
• SBIR/STTR Transfer	-2.635	0.000			
• Other Adjustments	0.000	0.000	-9.303	-	-9.303

Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Air Force	DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602201F: *Aerospace Vehicle Technologies*

Change Summary Explanation

Decrease in FY 2014 is due to higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force			DATE: April 2013
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)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
622401: *Structures*	-	46.275	42.021	44.062	-	44.062	45.656	49.595	51.954	54.528	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 aerospace structures and/or skin of the platform.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Service Life Technologies	19.763	24.502	28.476
Description: Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring schemes. ***FY 2012 Accomplishments:*** Continued the technology development of integrated sensors for determination of system health. Incorporated newly developed analysis tools. Continued the technology development of failure criteria tools for advanced high temperature aircraft components and concepts. Initiated technology efforts for condition-based maintenance of structural integrity. ***FY 2013 Plans:*** Continue development of engineered residual stress concepts, analysis, and applications. Continue the development concepts for risk informed decision-making. Continue efforts for condition-based maintenance of structural integrity. Complete the development of integrated sensors for determination of system health. Continue the development of failure criteria tools for advanced aircraft components and concepts. Initiate efforts in certification of advanced composite for aircraft structures. ***FY 2014 Plans:*** Complete development of engineered residual stress concepts, analysis, and applications. Continue the technology development concepts for risk informed decision-making. Continue technology efforts for condition-based maintenance of structural integrity. Continue the technology development of failure criteria tools for advanced aircraft components and concepts. Begin efforts to certify, verify and validate, and test advanced composite technologies for aircraft structures.			
Title: Airworthiness Certification Technologies	6.897	3.075	2.641
Description: Develop methodologies to reduce the cost and time involved in actual full-scale testing of components and aircraft prior to obtaining airworthiness certification.			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
FY 2012 Accomplishments: Continued development of methodologies that will allow for lower cost analytical certification of advanced composite structures. Initiated experimental validation of integrated system health management technologies for aircraft subsystems. Initiated the development of advanced aircraft flutter analysis tools. ***FY 2013 Plans:*** Continue development of multi-disciplinary methodologies that will allow for lower cost analytical certification of advanced composite structures. Complete experimental validation of integrated system health management technologies for aircraft subsystems. Continue the development of advanced aircraft flutter analysis tools. ***FY 2014 Plans:*** Continue development of multi-disciplinary methodologies that will allow for lower cost analytical certification of advanced designed structure. Continue the development of advanced aircraft flutter analysis tools.			
Title: Survivability and Performance Technologies ***Description:*** Develop design methods to capitalize on new materials, multi-role considerations, and technology integration of various subsystem hardware items and adaptive mechanisms into aircraft systems. ***FY 2012 Accomplishments:*** Continued the development of low-cost technologies to increase the survivability and performance of future systems. Developed and demonstrated system level thermal management concepts to meet the need of multi-function, multi-role, and adaptive aircraft. ***FY 2013 Plans:*** Continue the development of low-cost technologies to increase the survivability and performance of future systems. Decrease in FY 2013 due to higher Department of Defense priorities. ***FY 2014 Plans:*** Continue the development of low-cost technologies to increase the survivability and performance of future systems. Initiate efforts on energy efficient integration of conformal load bearing antenna technologies.	7.725	2.366	2.705
Title: Extreme Flight Environment Technologies ***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 2012 Accomplishments:***	11.890	12.078	10.240

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
Furthered the development of technologies for integrated air vehicle structures that can withstand extreme flight environments, incorporating advanced materials and design concepts. Initiated development of structural concepts and analysis methods for design and evaluation of hot primary structure. Continued to refine reusable and affordable space access concepts and apply these technologies for lower cost, reduced weight expendable vehicle airframes. ***FY 2013 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. Complete the refinement of affordable space access concepts and apply these technologies for lower cost, reduced weight expendable vehicle airframes. ***FY 2014 Plans:*** Continue to develop structural design concepts that incorporate promising materials and components for the creation of an integrated vehicle structure that can withstand extreme flight environments. Validate extreme environment prediction methods to develop key hot structure design data. Further development of analytical methods for predicting structural response needed for design and evaluation of hot primary structure for hypersonic vehicles.			
Accomplishments/Planned Programs Subtotals	46.275	42.021	44.062

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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 2014 Air Force			DATE: April 2013
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)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
622403: *Flight Controls and Pilot-Vehicle Interface*	-	38.992	36.189	35.238	-	35.238	34.081	34.508	32.710	33.341	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This project develops technologies that enable maximum affordable capability from manned and remotely piloted 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 2012	FY 2013	FY 2014
Title: Single Aircraft Advanced Flight Controls Technologies	9.642	16.304	14.902
Description: Develop technologies for advanced flight control systems, components, and integrated vehicle monitoring systems for both manned and remotely piloted aircraft. ***FY 2012 Accomplishments:*** Furthered the development of advanced control mechanization technologies to provide highly reliable operations for aerospace systems under adverse environments. Refined technology development of control architecture enhancements for remotely piloted systems. ***FY 2013 Plans:*** Further the development, assessment, and certification capability of advanced flight control mechanization technologies for highly reliable operations under adverse environments. Continue development of control configurations for small remotely piloted aerospace systems. Continue development of control systems hardening and health assessment technologies for enhanced survivability. ***FY 2014 Plans:*** Further the development, demonstration, and assessment of advanced flight control mechanization technologies for trusted and certifiable operations under adverse and contested environments. Continue development of control configurations for small remotely piloted aerospace systems. Continue development of survivable and health-adaptive control system architectures.			
Title: Multiple Aircraft Advanced Flight Controls Technologies	13.505	12.942	14.058

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
Description: Develop technology for flight control systems that will permit safe interoperability between manned and remotely piloted aircraft. ***FY 2012 Accomplishments:*** Continued performance analysis of mixed-initiative control of multiple remotely piloted aircraft packages. Refined the development and assessment of adaptive guidance and control technologies for fault/damage tolerance and rapid flight planning of aerospace vehicle operations. ***FY 2013 Plans:*** Further the development and assessment of advanced control automation techniques. Continue the development of mixed initiative control techniques for multiple remotely piloted aircraft teams, as well as for the integration of unmanned systems into controlled airspace and airbase operations. Continue the development and assessment of adaptive guidance and control technologies for fault/damage tolerance. ***FY 2014 Plans:*** Further the development, demonstration, and assessment of advanced control automation techniques. Continue the development of mixed initiative control techniques for multiple remotely piloted aircraft teams in dynamic mission environments, as well as for the integration of unmanned systems into controlled airspace and airbase operations. Complete the assessment of adaptive guidance and control technologies for fault/damage tolerance in unmanned space access systems.			
Title: Flight Controls Technologies Modeling and Simulation ***Description:*** Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles. ***FY 2012 Accomplishments:*** Conducted simulation events to evaluate emerging flight control technologies and concepts. Refined technology trade studies of remotely piloted air vehicles in manned/remotely piloted airspace and airbase operations. Refined trade studies of vehicle concepts for strike, mobility and reconnaissance. ***FY 2013 Plans:*** Continue to conduct modeling and simulation efforts to evaluate emerging flight control technologies and concepts, as well as assess mission-level performance of integrated air systems. Continue technology analyses of unmanned air systems in manned/unmanned airspace and airbase operations. Refine trade studies of vehicle concepts for strike, mobility and reconnaissance. ***FY 2014 Plans:***	15.845	6.943	6.278

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
Continue modeling and simulation efforts to evaluate emerging autonomous and survivable flight control technologies and concepts, as well as assess mission-level performance of integrated aerospace systems. Continue analyses of automated unmanned air systems in controlled airspace and airbase operations, as well as in adversarial mission environments. Continue trade studies of vehicle concepts for strike, mobility and reconnaissance.			
Accomplishments/Planned Programs Subtotals	38.992	36.189	35.238

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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 2014 Air Force			DATE: April 2013
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)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
622404: *Aeromechanics and Integration*	-	60.125	42.509	40.372	-	40.372	42.112	39.290	40.866	42.056	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 2012	FY 2013	FY 2014
Title: Aeronautical Technologies for Unmanned Aircraft	3.517	10.550	8.634
Description: Develop aerodynamic prediction efforts centered on expanding the design capabilities of manned and remotely piloted aircraft. ***FY 2012 Accomplishments:*** Developed and assessed aeronautical technologies that enable broad use of unmanned aircraft. Continued work to develop and demonstrate flow control to enable fluidic thrust vectoring, area control, and thermal management for a remotely piloted aircraft exhaust nozzle. Continued development of innovative aerodynamic control methods for small remotely piloted aircraft. ***FY 2013 Plans:*** Continue to develop and assess aeronautical technologies that enable broad use of unmanned aircraft. Continue work to develop and demonstrate flow control to enable unsteady load suppression, fluidic thrust vectoring, area control, and thermal management for a remotely piloted aircraft. Continue development of innovative aerodynamic control methods for remotely piloted aircraft. ***FY 2014 Plans:*** Continue to develop and assess aeronautical technologies that enable broad use of unmanned aircraft. Complete demonstration of flow control techniques to enable unsteady load suppression for unmanned ISR platforms and future fleet mobility aircraft to increase aerodynamic efficiency. Continue development of innovative aerodynamic control methods for integrating high bypass propulsion for unmanned ISR platforms and future mobility aircraft.			
Title: Concepts, Designs, and Analysis of High Speed Technologies	26.538	7.576	8.511

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
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 2012 Accomplishments:*** Continued development of analysis/design techniques and tools to enable shock/boundary layer interaction flow control and enhanced stability for high-speed propulsion concepts. Characterized high-speed phenomena and continued to develop and validate fundamental high-speed component technologies through experimental flight techniques in a relevant environment. ***FY 2013 Plans:*** Continue to develop technologies to enable high-speed flight. 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 2014 Plans:*** Continue to develop technologies to enable high-speed flight. 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 testing in a relevant environment.			
Title: Directed Energy Weapons Integration Technologies ***Description:*** Develop enabling technologies to allow integration of directed energy weapons into current and future air vehicle platforms. ***FY 2012 Accomplishments:*** Continued 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. Extended development of analysis tools for prediction of advanced flow control and adaptive optics to higher speed transonic/supersonic flows. ***FY 2013 Plans:*** N/A. ***FY 2014 Plans:*** N/A.	2.534	0.000	0.000
Title: Next Generation Multi-Role Large Aircraft Technologies	27.536	24.383	23.227

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
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 2012	FY 2013	FY 2014
Description: Develop and assess technologies for the next generation of multi-role large aircraft. ***FY 2012 Accomplishments:*** Continued to develop technologies that enable multiple roles and missions for delivery and support aircraft. Conducted 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 2013 Plans:*** Continue to develop aerodynamic and propulsion integration technologies that enable multiple roles and missions for delivery and support aircraft. Conduct analyses and experiments to investigate flow control for suppression of unsteady flow and enhanced drag reduction, and to enhance platform performance with integrated propulsion. ***FY 2014 Plans:*** Continue to develop aerodynamic and propulsion integration technologies that enable multiple roles and missions for delivery and support aircraft. Continue analyses and experiments to investigate flow control for suppression of unsteady flow and enhanced drag reduction, and to enhance platform performance with integrated propulsion. Begin studies investigating more extensive legacy fleet fuel savings opportunities. Extend swept wing laminar flow to higher Reynolds numbers.			
Accomplishments/Planned Programs Subtotals	60.125	42.509	40.372

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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.