Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	209.315	197.546	172.550	-	172.550	185.363	182.248	188.999	188.596	Continuing	Continuing
623012: *Advanced Propulsion Technology*	-	21.275	22.304	17.646	-	17.646	20.415	23.074	23.643	24.301	Continuing	Continuing
623048: *Combustion and Mechanical Systems*	-	14.290	13.235	12.008	-	12.008	12.123	12.278	12.507	12.748	Continuing	Continuing
623066: *Turbine Engine Technology*	-	91.999	77.444	57.245	-	57.245	63.292	50.298	53.808	54.416	Continuing	Continuing
623145: *Aerospace Power Technology*	-	27.054	26.587	29.393	-	29.393	31.139	32.404	32.549	31.530	Continuing	Continuing
624847: *Rocket Propulsion Technology*	-	49.753	52.651	51.287	-	51.287	53.372	59.068	61.266	60.276	Continuing	Continuing
625330: *Aerospace Fuel Technology*	-	4.944	5.325	4.971	-	4.971	5.022	5.126	5.226	5.325	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This program develops propulsion and power technologies to achieve enabling and revolutionary aerospace technology capabilities. The program has six projects, each focusing on a technology area critical to the Air Force. The Advanced Propulsion Technology project develops high-speed air breathing propulsion engines to include combined cycle, ramjet, and hypersonic scramjet technologies to enable revolutionary propulsion capability for the Air Force. The Combustion and Mechanical Systems project evaluates lubricants and combustion concepts and technologies for new and existing engines. The Turbine Engine Technology project develops enabling capabilities to enhance performance and affordability of existing weapon systems and develops component technologies for ultra high pressure ratio, substantially improved durability, and adaptive cycle engine architecture to provide optimized performance, fuel efficiency, and life for widely varying mission needs. The Aerospace Power Technology project develops electrical power and thermal management technologies for military applications that are part of energy optimized aircraft development. The Rocket Propulsion Technology project develops advances in rocket propulsion technologies for space access, space maneuver, missiles, the sustainment of strategic systems, and tactical rockets. The Aerospace Fuel Technology project evaluates hydrocarbon-based fuels for legacy and advanced turbine engines, scramjets, pulse detonation, and combined-cycle engines. 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 technologies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force					Date: March 2014
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*			R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*		
B. Program Change Summary ($ in Millions)	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO**	**FY 2015 Total**
Previous President's Budget	232.547	197.546	173.232	-	173.232
Current President's Budget	209.315	197.546	172.550	-	172.550
Total Adjustments	-23.232	-	-0.682	-	-0.682
• Congressional General Reductions	-0.394	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.640	-			
• Other Adjustments	-19.198	-	-0.682	-	-0.682

Change Summary Explanation

Decrease in FY13 Other Adjustments was due to Sequestration.
Decrease in FY15 is due to higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 623012 / *Advanced Propulsion Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
623012: *Advanced Propulsion Technology*	-	21.275	22.304	17.646	-	17.646	20.415	23.074	23.643	24.301	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project develops combined/advanced cycle air breathing high-speed (up to Mach 4) and hypersonic (Mach 5 to 7) propulsion technologies to provide revolutionary propulsion options for the Air Force. These new engine technologies will enable future high-speed/hypersonic weapons and aircraft concepts. The primary focus is on hydrocarbon-fueled engines capable of operating over a broad range of flight Mach numbers. Efforts include modeling, simulations, and proof of concept demonstrations of critical components; advanced component development; and ground-based demonstrations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Demonstrate Low Mach Scramjet Technologies	1.650	-	-
Description: Develop advanced fuel-cooled scramjet engine technologies to support flight demonstration and enable the broad application of hypersonics to meet future warfighter needs. ***FY 2013 Accomplishments:*** Completed development and demonstration of advanced engine control systems and flight weight scramjet engine components. Built upon prior ground and flight test data and experience to refine and demonstrate closed loop engine control system with advanced instrumentation to increase scramjet engine operability at low scramjet Mach numbers. Conducted direct connect testing of flight weight scramjet components for cold start systems. ***FY 2014 Plans:*** Advance scramjet engine controls and cold start demonstration development activities transition to Program 0603216F Aerospace Propulsion, project 635098 Advanced Aerospace Propulsion. ***FY 2015 Plans:*** N/A			
Title: Integrated Propulsion Technologies	0.120	-	-
Description: Conduct assessments, technology design trades, and simulations to integrate combined cycle engines (CCEs) and air breathing hypersonic propulsion technologies into future systems. ***FY 2013 Accomplishments:***			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623012 / *Advanced Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Complete engine performance objectives and road mapping to enable development of affordable hypersonic flight demonstrators jointly with NASA and DARPA. ***FY 2014 Plans:*** Effort transfered to Hypersonic Scramjet Technologies thrust in the same project, where component technologies will be integrated into scramjet engine subsystems for hypersonic systems. ***FY 2015 Plans:*** N/A			
Title: Hypersonic Scramjet Technologies ***Description:*** Develop robust hydrocarbon fueled scramjet engine components and technologies to improve performance, operability, durability, and scalability for future platforms. ***FY 2013 Accomplishments:*** Continued to develop advanced engine components to improve scramjet operating margin and to refine scramjet scaling laws for reusable applications. Continued to develop techniques to decrease scramjet take-over from Mach 4.5 to Mach 3.5 to provide robust options for CCEs. Continued to develop low internal drag flame stabilization devices and flight test engine components. Completed critical designs and initiate fabrication of scramjet combustors in medium scale (ten times) scramjet engines. Prepared for direct connect testing of medium scale (ten times) scramjet engines operating at Mach 3.5 to Mach 7 conditions. ***FY 2014 Plans:*** Continue to develop advanced engine components to improve scramjet operating margin and to refine scramjet scaling laws for reusable applications. Continue to develop techniques to decrease the minimum scramjet ignition from Mach 4.5 to Mach 3.5 to provide robust options for Combined Cycle Engines (CCEs). Continue to develop low drag flame stabilization devices and flight test components. Initiate direct testing of medium scale (ten times) scramjet engines operating at Mach 3.5 to Mach 7 conditions. ***FY 2015 Plans:*** Continue to develop advanced engine components to improve scramjet operating margin and to refine scramjet scaling laws for reusable applications. Continue to develop techniques to decrease scramjet take-over from Mach 4.5 to Mach 3.5 to provide robust options for CCEs. Continue to develop low internal drag flame stabilization devices and flight test engine components. Completed critical designs and initiate fabrication of scramjet combustors in medium scale (ten times) scramjet engines. Complete fabrication of heavyweight direct connect scramjet combustors. Initiate direct connect testing of medium scale (ten times) scramjet combustors from Mach 3.5 to Mach 7	19.505	22.304	17.646
Accomplishments/Planned Programs Subtotals	21.275	22.304	17.646

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623012 / *Advanced Propulsion Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 623048 / *Combustion and Mechanical Systems*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
623048: *Combustion and Mechanical Systems*	-	14.290	13.235	12.008	-	12.008	12.123	12.278	12.507	12.748	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project evaluates lubricants, mechanical systems, and combustion concepts for advanced turbine engines, pulse detonation engines, and combined cycle engines. This project also develops technologies to increase turbine engine operational reliability, durability, mission flexibility, maintainability, and performance while reducing weight, fuel consumption, and cost of ownership. Applications include missiles, aircraft, and sustained high-speed vehicles. Analytical and experimental areas of emphasis include lubricants, bearings, mechanical systems diagnostics, mechanical systems prognostics, rotor dynamics, oil-less engine technology, optical diagnostics, fundamental combustion, detonations, combustors, and afterburners. Lubricants for these engines must be thermally stable, cost-effective, and operate over a broad range of conditions. Advanced combustion concepts must be cost-effective, durable, and reduce pollutant emissions. A portion of this project supports adaptive cycle technologies. This effort develops component technology for an adaptive cycle engine architecture that provides optimized performance/fuel efficiency for widely varying mission needs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Combustion Technologies	5.583	5.116	4.658
Description: Develop, test, and evaluate revolutionary combustion and propulsion concepts for gas turbine, pulse detonation, and combined cycle engines for missiles, manned and unmanned systems.			
FY 2013 Accomplishments: Developed new models for combustion processes at high pressure conditions. Tested combustion system designs that produced low pollutant emissions. Tested rotational detonation engine (RDE) concepts coupled with conventional turbomachinery. Evaluated alternative fuels and their impact on engine performance and durability. Tested novel compact combustion systems at relevant operating conditions.			
FY 2014 Plans: Design and test full-annular ultra compact combustors. Evaluate augmentor technologies for screech reduction. Fabricate and test reference combustors for alternative fuels. Implement new technologies to operate small-scale propulsion systems with reduced octane fuels. Continue to develop new rotational detonation engine (RDE) concepts.			
FY 2015 Plans: Begin to develop combustor, augmentor and constant volume combustion or pressure gain combustion technologies such as pulse detonation engines (PDEs) or rotational detonation engines (RDEs) to enable the next generation of gas turbine engines,			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623048 / *Combustion and Mechanical Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
new engine cycles, and combined-cycles. Explore the interactions and effects of compressor and turbine components on the combustor and combustor materials, to reduce engine weight and increase efficiency. Continue using advanced diagnostics to obtain high-quality datasets that can be made available to and used by academia and industry for model development. Maintain efforts to determine necessary reference performance and operability combustion systems and metrics to decrease the cost of certifying new and alternative fuels in weapon systems.			
Title: Diagnostic Technologies ***Description:*** Develop and demonstrate optical, electromechanical, and laser diagnostic tools and sensors for application to revolutionary propulsion technologies. ***FY 2013 Accomplishments:*** Applied advanced laser diagnostics and novel optics configurations to high pressure test cell environment. Demonstrated particle image velocimetry in high pressure combustion test apparatus. Investigated high-speed measurement techniques for combustion temperature and species. ***FY 2014 Plans:*** Develop high-speed laser systems to measure combustion species, temperature, and velocity. Apply new diagnostics to combustion systems at relevant engine conditions. Refine fiber optic methods for high-power laser diagnostics use. ***FY 2015 Plans:*** Develop and demonstrate diagnostic systems for high-bandwidth (kHZ-MHz) measurements of combustion chemistry and physics based on 1) time-division-multiplexed hyperspectral absorption spectroscopy, 2) pulse-burst lasers, and 3) ultrashort-pulse (picosecond, femtosecond) lasers. Apply to laboratory flame test rigs, engine test cells, and fielded systems.	1.015	0.991	0.927
Title: Lubricant Technologies ***Description:*** Develop, test, and qualify advanced turbine engine lubricants. Generate and maintain military specifications for aviation engine lubricants. ***FY 2013 Accomplishments:*** Demonstrated lube system health management control algorithms with full-scale technology readiness level 5 test rig hardware. Tested enhanced ester oils in demonstrator turbine engines. Continued investigating advanced lube system thermal management technologies for fuel efficient turbine engines. Developed new oil traction models and validated them with experimental data. ***FY 2014 Plans:*** Finalize transition plans of enhanced ester oil to current and future engines. Qualify additional enhanced ester oil candidates for field use. Demonstrate advanced mechanical system health monitoring algorithms on full-scale demonstrator engine. Continue	3.764	3.490	3.123

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623048 / *Combustion and Mechanical Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
investigating advanced lube system thermal management technologies for fuel efficient engines. Incorporate new traction models into bearing heat generation models. ***FY 2015 Plans:*** Execute plan for transitioning Enhanced Ester (EE) oils into the fleet. Demonstrate EE oils on Adaptive Engine Technology Demonstrator (AETD) engine cores. Develop transition plans for mechanical system health monitoring system technologies. Continue investigating advanced lube system thermal management technologies for fuel efficient and hi-mach engine applications.			
Title: Bearing Technologies ***Description:*** Develop and test advanced bearing material technology and bearing concepts for small, intermediate, and large-sized turbine engine applications. ***FY 2013 Accomplishments:*** Conducted parametric active thrust control experiments to validate load control algorithms. Conducted seeded fault bearing tests to validate reliable active and autonomous thrust load control. Continue to integrate active thrust control, vibration, and oil debris sensing for complete technology readiness level (TRL) 6 five mechanical system health management system. Coordinate plans for demonstrating active thrust control system in future TRL 6 engine demonstration. ***FY 2014 Plans:*** Conduct full-scale bearing tests in support of adaptive turbine engines. Conduct foil bearing rig tests in support of expendable supersonic turbine engine follow-on development. Develop improved bearing material life model. Mature autonomous active thrust bearing system. Finalize transition plans of hybrid ceramic/metallic bearings into upgrades of current aircraft. ***FY 2015 Plans:*** Continue full-scale bearing rig testing in support of adaptive, fuel efficient engines. Continue oil-free, foil bearing R&D in support of supersonic expendable engines and remotely piloted aircraft. Continue developing improved bearing material life model. Continue maturing active bearing thrust control system and fuse with engine prognostics health monitoring system for future fuel efficient engines.	3.928	3.638	3.300
Accomplishments/Planned Programs Subtotals	14.290	13.235	12.008

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623048 / *Combustion and Mechanical Systems*

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 623066 / *Turbine Engine Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
623066: *Turbine Engine Technology*	-	91.999	77.444	57.245	-	57.245	63.292	50.298	53.808	54.416	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project develops technology to increase turbine engine operational reliability, durability, mission flexibility, and performance, while reducing weight, fuel consumption, and cost of ownership. Analytical and experimental areas of emphasis are fans and compressors, high temperature combustors, turbines, internal flow systems, controls, augmentor and exhaust systems, integrated power and thermal management systems, engine inlet integration, mechanical systems, adaptive cycle technologies, and structural design. This project develops component technology for an adaptive cycle engine architecture that provides optimized performance/fuel efficiency for widely varying mission needs. This project supports joint Department of Defense, agency, and industry efforts to focus turbine propulsion technology on national needs. The program plan is relevant across capability areas for global responsive strike, tactical and global mobility, responsive space lift, and persistent intelligence, surveillance, and reconnaissance (ISR).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Turbofan/Turbojet Engine Core Technologies	36.578	35.062	27.905
Description: Develop core turbofan/turbojet engine components (i.e., compressors, combustors, and turbines) for fighters, bombers, sustained supersonic/hypersonic cruise vehicles, and transports.			
FY 2013 Accomplishments: Continued to develop modeling and simulation tools for advanced components including coupled aerothermal models and turbine durability design. Continued to conduct bench and rig test using surface mapping thin film temperature gauges. Developed high resolution non-contact stress measurement systems for high frequency response measurement. Demonstrate improvements from active clearance and flow control. Conducted rig testing of high-power low-emission combustion. Developed improved compressor aerodynamic design tools to extend engine operability and increase efficiency.			
FY 2014 Plans: Continue developing modeling and simulation tools for advanced components including coupled aerothermal models; highly loaded, low emissions combustion systems; and turbine durability designs. Perform structural assessment research of combustor and turbine components operating in a realistic engine environment. Continue to develop improved compressor aerodynamic design tools to extend engine operability and incresae efficiency. Initiate conceptual design of efficient, very high pressure ratio core component technologies. Complete Adaptive Versatile Engine Technology (ADVENT)effort.			
FY 2015 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Continue developing modeling and simulation tools for advanced components including coupled aerothermal models; highly loaded, low emissions combustion systems; and turbine durability designs. Perform structural assessment research of combustor and turbine components operating in a realistic engine environment. Continue to develop improved compressor aerodynamic design tools to extend engine operability and efficiency. Complete conceptual design, and initiate detailed design of efficient, very high pressure ratio core component technologies.			
Title: Turbofan/Turbojet Engine Fan, Low Pressure Turbine, and Integration Technologies ***Description:*** Develop turbofan/turbojet engine components (i.e., fans, nozzles, etc.) used in engines for fighters, bombers, sustained supersonic strike and hypersonic cruise vehicles, and transports. ***FY 2013 Accomplishments:*** Developed modeling and simulation tools including methods to predict behavior of serpentine inlets and nozzles. Demonstrated methods to detect/predict incipient bearing damage to ensure engine operation. ***FY 2014 Plans:*** Continue to develop modeling and simulation tools including methods to predict behavior of serpentine inlets and nozzles. Develop modeling and simulation tools to predict fan/inlet interaction for both podded and embedded propulsion systems. Develop a probabilistic ignition prediction tool for advanced augmentor design. Develop models to validate function and durability of high temperature electronics for engine control. ***FY 2015 Plans:*** Initiate adaptive engine conceptual designs to reduce specific fuel consumption reduction by up to 35% for embedded high bypass turbofans, and for sustained supersonic strike applications. Continue to develop modeling and simulation tools including methods to predict behavior of serpentine inlets and nozzles. Conduct bench and rig tests to validate modeling and simulation tools to predict fan/inlet interaction for both podded and embedded propulsion systems. Conduct bench and rig tests to validate probabilistic ignition prediction tool for advanced augmentor design. Develop models to validate function and durability of high temperature electronics for engine control.	8.672	8.177	23.615
Title: Missile and Remotely Piloted Aircraft Engine Technologies ***Description:*** Develop limited life engine components for missile and remotely piloted aircraft (RPA) applications, including long-range supersonic and hypersonic vehicles. ***FY 2013 Accomplishments:*** Developed and applied advanced modeling and simulation tools for variable cycle component design, advanced cooling concepts, compact augmentors, and composite structures. Demonstrated advanced designs in rig testing. ***FY 2014 Plans:***	3.993	3.900	4.541

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Continue to develop and apply advanced modeling and simulation tools for variable cycle component design, advanced cooling concepts, compact augmentors, and composite structures. Continue to demonstrate advanced designs in rig testing. Develop and validate a test protocol for small engine augmentor designs. ***FY 2015 Plans:*** Continue to develop and apply advanced modeling and simulation tools for variable cycle component design, advanced cooling concepts, compact augmentors, and composite structures. Continue to demonstrate advanced designs in rig testing. Utilize validation data to develop improved test protocol for small engine augmentor designs.			
Title: Turboshaft/Turboprop and Small Turbofan Engine Technologies ***Description:*** Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ***FY 2013 Accomplishments:*** Developed and applied advanced modeling and simulation tools for advanced cooling concepts, high efficiency gearboxes, and high performance airfoils. Developed advanced vibration and temperature sensors for use in demonstration of engine durability requirements. ***FY 2014 Plans:*** Continue to develop and apply advanced modeling and simulation tools for advanced cooling concepts, high efficiency gearboxes, and high performance airfoils. Continue to develop advanced vibration and temperature sensors for use in demonstration of engine durability requirements. ***FY 2015 Plans:*** Continue to refine and develop and apply advanced modeling and simulation tools for advanced cooling concepts, high efficiency gearboxes, and high performance airfoils. Continue to develop advanced vibration and temperature sensors for use in demonstration of engine durability requirements.	1.545	1.626	1.184
Title: Adaptive Turbine Engine Technologies ***Description:*** Develop high performance, durable components which enable adaptive turbine engine technologies. ***FY 2013 Accomplishments:*** Completed adapative engine conceptual designs meeting goals to reduce 25% reduction in specific fuel consumption and 10% increase in thrust over fifth generation fighter class engines with comparable weight and unit cost. Initiated preliminary designs addressing extensive performance, operability, maintainability, and prognostic health management requirements. Designed and conducted ground rig tests to validate preliminary design technologies and reduce risk for several parts of adaptive engines such as adaptive fans, high pressure compressors, combustors, high and low pressure turbines, mechanical system components,	41.211	28.679	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
controls and accessories, thermal management subsystems, and three-stream compatible afterburner/exhaust systems. Conducted ground rig testing of at least two unique adaptive fan concepts. Completed the design, procurement, and assembly of hardware for ground rig tests and initiate ground rig tests. ***FY 2014 Plans:*** Complete detailed design of at least two unique adaptive fan concepts and initiate fabrication of components for ground engine testing. Continue to conduct ground rig tests to validate preliminary design technologies and reduce risk for several parts adaptive engines. Transition effort from development to demonstration of parts of adaptive engines. This completes this effort. ***FY 2015 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	91.999	77.444	57.245

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 623145 / *Aerospace Power Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
623145: *Aerospace Power Technology*	-	27.054	26.587	29.393	-	29.393	31.139	32.404	32.549	31.530	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project develops electrical and thermal management technologies for military aerospace applications. Power component technologies are developed to increase reliability, maintainability, commonality, affordability, and supportability of aircraft and flight line equipment. Research is conducted in energy storage and hybrid power system technologies to enable special purpose applications. Electrical power and thermal management technologies enable future military megawatt level power and thermal management needs. This project supports development of electrical power and thermal management component and systems suitable for applications to legacy and future aircraft platforms including strike and mobility concepts. Lightweight power systems suitable for other aerospace applications are also developed.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: High Power System Technologies	26.798	26.587	29.393
Description: Develop electrical power and thermal management component and subsystem technologies with low volume displacement for delivery of high power for manned and unmanned systems. ***FY 2013 Accomplishments:*** Completed critical design review of Integrated Vehicle Energy Technology (INVENT) effort to develop adaptive power and thermal management subsystems for next generation military air platforms. Initiated platform tip-to-tail modeling and simulation energy optimization for potential INVENT integration into current and future fifth generation fighter class aircraft. ***FY 2014 Plans:*** Initiate testing of adaptive power and thermal management subsystems hardware for next generation air platforms in conjunction with continued platform level tip-to-tail modeling and simulation energy optimization. ***FY 2015 Plans:*** Initiate integrated ground demonstration of adaptive power and thermal management system for next generation air platforms. Continue testing of subsystems hardware in conjunction with continued platform level tip-to-tail modeling and simulation energy optimization. Initiate development of advanced, safe energy storage and management systems to include Silicon Carbide applications and batteries.			
Title: Special Purpose Application Technologies	0.256	-	-
Description: Develop technologies for special purpose applications, including hybrid electrical power, thermal management systems, and energy conversion/storage components and subsystems.			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 623145 / *Aerospace Power Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
FY 2013 Accomplishments: Complete power generation and management advanced technology demonstration to transition to Air Force customer, Air Force Special Operations Command (AFSOC), to provide enhanced capability and endurance for battlefield airmen. This effort was completed in FY13. ***FY 2014 Plans:*** N/A ***FY 2015 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	27.054	26.587	29.393

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 624847 / *Rocket Propulsion Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
624847: *Rocket Propulsion Technology*	-	49.753	52.651	51.287	-	51.287	53.372	59.068	61.266	60.276	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project develops rocket propulsion technologies for space access, space maneuver, the sustainment of strategic systems (including solid boost/missile propulsion, post boost control, aging and surveillance efforts), and tactical missiles. Analytical and experimental areas of emphasis are propellants, propellant management, combustion, rocket material applications, technology for sustainment of strategic systems, and innovative space propulsion concepts. Technologies of interest will improve reliability, performance, survivability, affordability, and environmental compatibility of these systems. Technologies are developed to reduce the weight and cost of components using new materials and improved designs and manufacturing techniques. All efforts in this project contribute to the sustainment of the rocket propulsion industry, providing rocket propulsion technology for the entire DoD. Technologies developed under this program enable capabilities of interest to both DoD and NASA. Efforts include modeling and simulation, proof of concept tests of critical components, advanced component development, and ground-based tests. Aging and surveillance efforts could reduce lifetime prediction uncertainties for individual motors by 50%, enabling motor replacement for cause. All efforts are part of the Rocket Propulsion 21 (RP21) program and reviewed by a DoD level steering committee yearly for relevance to DoD missions and achievement of RP21 Goals.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Fuel Technologies	7.600	6.085	6.306
Description: Develop, characterize, and test advanced hydrocarbons, energetics, solid propellants, and monopropellants to increase space launch payload capability and refine new synthesis methods.			
FY 2013 Accomplishments: Analyzed and tested new candidates for potential hydrocarbon fuel additives to improve performance of kerosene. Continued synthesis and downselect processes and scale-up of promising high energy-density materials candidates, identified synthesis process reducing an ingredient's cost 90%. Continued to develop methods and additives to reduce fuel coking in rocket engine environments. Evaluated candidate propellants in advanced combustion devices. Developed and characterized next generation ionic liquids for use in spacecraft and missile defense applications. Developed scale-up capability for advanced solid propellant ingredients, capable of 20 liters.			
FY 2014 Plans: Evaluate methods for removing components from fuels that adversely affect fuel coking in rocket engine environments. Evaluate scaled-up propellants in advanced combustion devices to determine materials compatibility and performance to include supporting large-scale motor tests. Continue development and characterization of next generation ionic liquid propellants for use in			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 624847 / *Rocket Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
spacecraft and missile defense applications. Complete scale-up capability for advanced solid propellant ingredients. Evaluate and modify polymeric systems for use in rocket applications. ***FY 2015 Plans:*** Scale up methods for removing components from fuels that adversely affect fuel coking in rocket engine environments. Evaluate scaled-up propellants in advanced combustion devices to determine materials compatibility and performance to include supporting large-scale motor tests. Develop advanced binder systems to enable use of advance solid propellant ingredients with significant improvements over state of the art. Complete scale-up capability to 60 liters for advanced solid propellant ingredients and begin testing these ingredients in large scale motors. Continue development and characterization of next generation ionic liquid propellants for use in spacecraft and missile defense applications.			
Title: Liquid Engine Combustion Technologies ***Description:*** Develop advanced liquid engine combustion technology for improved performance, while preserving chamber lifetime and reliability needs for engine uses in heavy lift space vehicles. ***FY 2013 Accomplishments:*** Began efforts looking at multi-injector designs and control effectors. Provided advanced combustion device technology into a hydrocarbon boost demo and to various contractor designs and continue additional analysis on changing designs and concepts. Developed improved understanding of fundamental combustion and fluid flow/heat transfer processes leading to new methodologies for thermal management, scaling, and combustion instabilities in hydrocarbon fueled liquid rocket engines, reducing the need for conducting large numbers of costly full-scale component and engine tests. Evaluated novel nozzle cooling channels for use with hydrocarbon fuels in the high heat flux test rig. Conducted validation and verification of advanced modeling and simulation capabilities. Developed understanding of kerosene production to determine what components affect fuel coking and should be removed from the fuel during the production process. Completed modification of test cell and conduct first hot-fire tests of combustion stability rig. ***FY 2014 Plans:*** Begin evaluation of injector concepts in hot fire conditions. Continue efforts looking at multi-injector designs and control effectors. Continue transition of candidate injector technologies to contractor for use in Hydrocarbon Boost (HCB), a rocket engine ground demonstration. Continue hot fire tests in combustion stability rig and feed data to HCB to influence supporting design efforts. Incorporate data from HCB sub-scale preburner testing into combustion models. Continue to develop and demonstrate in-house, moderate scale liquid rocket component testing capability-complete hot fire capability to support risk reduction in hydrocarbon boost technology. Continue to develop high performance compact liquid rocket engine technologies. Continue characterization of novel cooling channels and transfer info to HCB to influence rocket engine thrust chamber design. Continue developing understanding of hydrocarbon fuel production, what components affect fuel coking and should be removed from the fuel (or	6.742	6.178	6.196

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
added) during the production process, how can fuels be engineered with a purpose. Continue to evaluate and develop advanced material solutions for high temperature components in rocket engines. ***FY 2015 Plans:*** Continue evaluation of injector concepts in hot fire conditions. Continue efforts looking at multi-injector designs and control effectors. Continue transition of candidate injector technologies to contractor for use in Hydrocarbon Boost (HCB), a rocket engine ground demonstration. Continue hot fire tests in combustion stability rig and feed data to HCB to influence supporting design efforts. Continue combustion stability modeling critical to supporting Hydrocarbon Boost Demonstration and all future kerosene fueled liquid rocket engines. Complete characterization of novel cooling channels and transfer info to HCB to influence rocket engine thrust chamber design. Continue developing understanding of hydrocarbon fuel production, what components affect fuel coking and should be removed from the fuel (or added) during the production process, how can fuels be engineered with a purpose. Continue to evaluate and develop advanced material solutions for high temperature components in rocket engines. Continue to develop and demonstrate in-house, moderate scale liquid rocket component testing capability-complete hot fire capability to support risk reduction in hydrocarbon boost technology. Continue to develop high performance compact liquid rocket engine technologies.			
Title: Advanced Material Applications ***Description:*** Develop advanced material applications for lightweight components and material property enhancements for current and future rocket propulsion systems. ***FY 2013 Accomplishments:*** Supported transition efforts of advanced polymers to operational missile systems. Down selected to a single method of material deposition, characterize and document for follow-on development and future potential acquisition programs. Finished nano-material activities. This effort completed in FY13. ***FY 2014 Plans:*** N/A. ***FY 2015 Plans:*** N/A	1.000	-	-
Title: Advanced Liquid Engine Technologies ***Description:*** Develop advanced liquid engine technologies for improved performance, while increasing life and reliability needs for engine uses in expendable and reusable launch vehicles. ***FY 2013 Accomplishments:***	12.553	16.589	16.829

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Developed enabling hydrocarbon boost technology for future spacelift concepts and continue risk reduction activities for the development of hydrocarbon boost technologies. Developed and demonstrated in-house, moderate scale liquid rocket component testing capability. Completed gas phase and super critical phase testing capability and begin experiments, which is also work supporting risk reduction in hydrocarbon boost. Developed high performance compact liquid rocket engine technologies. ***FY 2014 Plans:*** Continue to develop enabling hydrocarbon boost technology for future spacelift concepts and continue risk reduction activities for the development of hydrocarbon boost technologies (subscale turbopump assembly, thrust chamber assembly). ***FY 2015 Plans:*** Continue to develop enabling hydrocarbon boost technology for future spacelift concepts and continue risk reduction activities for the development of hydrocarbon boost technologies (subscale turbopump assembly, thrust chamber assembly).			
Title: On-Orbit Propulsion Technologies ***Description:*** Develop solar electric, solar thermal, chemical, and advanced propulsion technologies for station-keeping, repositioning, and orbit transfer for satellites and satellite constellations. ***FY 2013 Accomplishments:*** Conducted scale-up of advanced monopropellants and evaluate advanced ignition schemes and chamber concepts. Continued development of next generation high power electric spacecraft propulsion. Continued advanced modeling and simulation tool developments to improve design and analysis tools for a wide range of spacecraft propulsion concepts/technologies. Began development of new bi-propellant thruster technologies to take advantage of new non-toxic liquid propellants. ***FY 2014 Plans:*** Conduct scale-up of advanced monopropellants and evaluate advanced ignition schemes and chamber concepts. Continue development of next generation high power electric spacecraft propulsion. Continue advanced modeling and simulation tool developments to improve design and analysis tools for a wide range of spacecraft propulsion concepts/technologies, incorporating multi-scale/multi-physics. Conduct experiments to understand the physics behind the wide range of spacecraft propulsion concepts/technologies and accurately model the physics. Begin transition of new thruster modeling framework to spacecraft industry for use in future designs. Explore and develop new generation of chemical spacecraft thruster technologies. Begin initial support for future NASA flight of the Air Force Research Laboratory's AF-M315E non-toxic monopropellant (replaces toxic Hydrazine currently used in spacecraft). ***FY 2015 Plans:*** Conduct scale-up of advanced monopropellants and evaluate advanced ignition schemes and chamber concepts. Continue development of next generation high power electric spacecraft propulsion. Continue advanced modeling and simulation tool	11.813	12.316	12.408

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Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 624847 / *Rocket Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
developments to improve design and analysis tools for a wide range of spacecraft propulsion concepts/technologies, incorporating concepts/technologies and accurately model the physics. Continue transition of new thruster modeling framework to spacecraft industry for use in future designs. Explore and develop new generation of chemical spacecraft thruster technologies. Continue support of future NASA flight of AFRL's AF-M315E non-toxic monopropellant (replaces toxic Hydrazine currently used in spacecraft).			
Title: Space Access and Strike Applications ***Description:*** Develop missile propulsion and boost technologies for space access and strike applications. ***FY 2013 Accomplishments:*** Developed advanced tactical propulsion technologies. Continued development and evaluation of next generation of updated, physics-based modeling, simulation, and analysis tools for missile propulsion components and applications. Developed advanced component technologies for missile propulsion applications for strategic and strike systems helping to ensure their long-term sustainment. ***FY 2014 Plans:*** Continue to develop advanced tactical propulsion. Continue development and evaluation of next generation of updated, physics-based modeling, simulation, and analysis tools for missile propulsion components and applications. Continue to develop advanced component technologies for missile propulsion applications for strategic and strike systems helping to ensure their long-term sustainment. Complete propellant combustion and hazards characterization efforts. ***FY 2015 Plans:*** Continue to develop advanced tactical propulsion. Continue development and evaluation of next generation of updated, physics-based modeling, simulation, and analysis tools for missile propulsion components and applications. Continue to develop advanced component technologies for missile propulsion applications for strategic and strike systems helping to ensure their long- term sustainment. Continue propellant development efforts.	6.038	6.755	5.428
Title: Ballistic Missile Technologies ***Description:*** Develop missile propulsion technologies and aging and surveillance technologies for ballistic missiles. ***FY 2013 Accomplishments:*** Conducted sub-scale testing of existing and advanced sensors to be attached to solid rocket motors and tools that can integrate sensor data into existing aging and surveillance tool suite. Integrated advanced aging and surveillance technologies into demonstrations to validate and verify efforts to reduce uncertainties and accurately model motor behavior. Continued to apply	4.007	4.728	4.120

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
next generation of chemical and aging mechanism modeling, simulation, and analysis tools, sensor schemes and tools, and non-destructive analysis tools. ***FY 2014 Plans:*** Complete sub-scale testing of existing and advanced sensors to be attached to solid rocket motors and tools that can integrate sensor data into existing aging and surveillance tool suite. Complete integration of advanced aging and surveillance technologies into full-scale demonstrations to validate and verify efforts to reduce uncertainties and accurately model motor behavior. Apply next generation of chemical and aging mechanism modeling, simulation, and analysis tools, sensor schemes and tools, and non- destructive analysis tools. Complete data management system used to track and correlate aging and surveillance data for individual missiles. Begin advanced sensor development efforts to further improve data acquisition and reduce uncertainty in ballistic missile life predictions. ***FY 2015 Plans:*** Apply next generation of chemical and aging mechanism modeling, simulation, and analysis tools, sensor schemes and tools, and non- destructive analysis tools. Continue advanced sensor development efforts to further improve data acquisition and reduce uncertainty in ballistic missile life predictions. Support transition of previous tools, models, data management system to user.			
Accomplishments/Planned Programs Subtotals	49.753	52.651	51.287

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / *Aerospace Propulsion*	Project (Number/Name) 625330 / *Aerospace Fuel Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
625330: *Aerospace Fuel Technology*	-	4.944	5.325	4.971	-	4.971	5.022	5.126	5.226	5.325	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project evaluates hydrocarbon-based fuels for legacy and advanced turbine engines, scramjets, pulse detonation and combined cycle engines. This project also considers fuel related concepts that can increase turbine engine operational reliability, durability, mission flexibility, energy efficiency, and performance while reducing weight, fuel consumption, and cost of ownership. Applications include missiles, aircraft, sustained high-speed vehicles, and responsive space launch. Analytical and experimental areas of emphasis include evaluations of fuel properties and characteristics of alternative fuels developed from unconventional sources (such as coal, natural gas, biomass, and combinations thereof), unique/alternate fuels and components used in integrated thermal and energy management systems including high heat sink fuel capability, fuels logistics and associated vulnerabilities, and combustion diagnostics and engine emissions measurements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Alternative Fuels	2.250	2.364	2.100
Description: Conduct evaluations and perform technical assessments of alternative hydrocarbon fuels derived from coal, natural gas, and biomass for use in legacy and advanced aerospace systems. ***FY 2013 Accomplishments:*** Continued evaluation of industry-submitted alternative fuel samples. Tri-service coordinated efforts focus on hydrocarbon composition, jet-in-diesel performance, bulk modulus, and stability during long-term military storage/handling. ***FY 2014 Plans:*** Continue evaluation of cellulosic aviation biofuels, focusing on potential fuels capable of being used at a 100% pure state rather than blends. ***FY 2015 Plans:*** Evaluate fuel properties from co-processing biomass and petroleum.			
Title: Integrated Thermal and Energy Management	0.990	1.045	1.000
Description: Develop and demonstrate advanced components and conduct performance assessments of advanced aircraft integrated thermal and energy management systems for engines and aircraft. ***FY 2013 Accomplishments:***			

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Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 625330 / *Aerospace Fuel Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Evaluated alternative fuel compositions to increase life and heat sink in hydrocarbon-based endothermic fuels, using reduced-scale rigs to simulate engine-scale fuel system conditions. ***FY 2014 Plans:*** Develop advanced producible endothermic fuel composition with enhanced heat sink and life to support medium-scale scramjet engine demonstrations. ***FY 2015 Plans:*** Develop and evaluate nano-catalysts/nano-additives for enhancing heat sink and reducing coking.			
Title: Fuel Logistics ***Description:*** Study and evaluate low-cost approaches to reduce fuel logistics footprint to reduce cost. Study fuel logistics vulnerabilities and develop detection and mitigation technologies. ***FY 2013 Accomplishments:*** Assessed impact of conversion to commercial jet fuel (without military jet fuel additives) on biological growth in base fuel systems. Evaluated cross-section of Jet A fuels using advanced instrumentation to develop chemical composition information to link to fuel properties and performance to support Jet A conversion. ***FY 2014 Plans:*** Develop composition-to-performance link and models for Jet A fuels for physical properties. ***FY 2015 Plans:*** Evaluate anti-microbial peptides and biological active control for mitigating biological growth an aviation fuels.	0.900	0.958	0.940
Title: Combustion Emissions and Performance ***Description:*** Develop and test advanced emissions diagnostic techniques for airbreathing propulsion systems. Conduct evaluations of the combustion and emissions characteristics of aviation fuels. ***FY 2013 Accomplishments:*** Developed methodology to assess operability of fuels in high pressure combustor rig. ***FY 2014 Plans:*** Evaluate combustor operability of narrow-boiling and high/low cetane alternative fuels as well as fully-synthetic fuels. ***FY 2015 Plans:*** Evaluate advanced in-situ diagnostics to assess in-combustor engine emissions and combustion characteristics.	0.804	0.958	0.931
Accomplishments/Planned Programs Subtotals	4.944	5.325	4.971

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602203F / *Aerospace Propulsion*	**Project (Number/Name)** 625330 / *Aerospace Fuel Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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.