Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/Demo*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	103.123	126.002	102.949	0.000	102.949	79.994	84.998	86.480	88.211	Continuing	Continuing
634920: *Flight Vehicle Tech Integration*	-	20.336	31.679	31.969	0.000	31.969	33.618	34.844	35.312	36.019	Continuing	Continuing
634926: *High Speed/Hypersonic Intgr and Demo*	-	68.376	78.324	48.959	0.000	48.959	21.592	22.031	22.476	22.926	Continuing	Continuing
634927: *Flight Systems Control*	-	14.411	15.999	22.021	0.000	22.021	24.784	28.123	28.692	29.266	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program supports Department of Defense (DoD) priorities for demonstrations in hypersonics and manned/unmanned systems, respectively. This effort integrates and demonstrates advanced flight vehicle technologies that improve the performance and supportability of existing and future aerospace vehicles. System level integration brings together aerospace vehicle technologies along with avionics, propulsion, and weapon systems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational aircraft. Projects in this program have been coordinated through the DoD Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601F, and 0602298F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is $14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev/Demo*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	115.966	121.002	105.411	0.000	105.411
Current President's Budget	103.123	126.002	102.949	0.000	102.949
Total Adjustments	-12.843	5.000	-2.462	0.000	-2.462
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	5.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-0.134	0.000			
• SBIR/STTR Transfer	-1.018	0.000			
• Other Adjustments	-11.691	0.000	-2.462	0.000	-2.462

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 634920: *Flight Vehicle Tech Integration*		
Congressional Add: *Program increase - aircraft winglets and drag reduction devices*	0.000	5.000
Congressional Add Subtotals for Project: 634920	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

Decrease in FY 2018 of $11.691 million in Other Adjustments is due to realignment of funds to PE 0602212F to support Research and Development Projects, 10 U.S.C. Section 2358.

Decrease in FY 2020 of $2.462 million is due to changes in Air Force Science and Technology advanced technology demonstrations.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/ Demo*	Project (Number/Name) 634920 / *Flight Vehicle Tech Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
634920: *Flight Vehicle Tech Integration*	-	20.336	31.679	31.969	0.000	31.969	33.618	34.844	35.312	36.019	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project demonstrates advanced aerospace vehicle technologies. Aerospace Vehicle Technology Integration efforts are accomplished through integration of various technologies to include avionics, advanced propulsion, and weapon systems for demonstration in near-realistic operational environments. Advanced Aerospace Structures Technologies are demonstrated to enhance the capability of current and future aerospace vehicles.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Aerospace Vehicle Technology Integration	10.687	10.342	15.052
Description: Develop, simulate, and demonstrate integrated technologies to improve the performance of aerospace platform capabilities. ***FY 2019 Plans:*** Continue next generation mobility vehicle technology experiments. Initiate integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Initiate the flight demonstration of a low cost unmanned aerospace systems (UAS) capable of interoperations with different UAS assets. Initiate propulsion integrations component validation tests for Air Superiority 2030 requirements. ***FY 2020 Plans:*** Continue integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Continue the flight demonstration of a low cost unmanned aerospace systems capable of interoperations with different UAS assets; completing a sensor extension variant in FY 2020 and initiating an off-board weapons station variant. Continue propulsion integration component validation tests for Air Superiority 2030 requirements. Initiate flight demonstrations of practical laminar flow for swept wing aircraft designs. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $4.710 million. Funding increased due to additional emphasis in the fight demonstrations of low cost unmanned aerospace systems.			
Title: Advanced Aerospace Structure Technologies	9.649	16.337	16.917
Description: Develop and demonstrate affordable, lightweight, adaptive, and multifunctional structural concepts integrated into aerospace systems.			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev/ Demo*	**Project (Number/Name)** 634920 / *Flight Vehicle Tech Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 Plans: Continue low cost airframe design and manufacturing demonstrations. Continue low cost attritable aircraft flight demonstration analysis and support. Initiate structural life extension demonstration of legacy fleet metallic structures. ***FY 2020 Plans:*** Continue low cost airframe design and manufacturing demonstrations: completing rapid manufacturing demonstrations of airframe components in FY 2020, and initiating fully automated manufacturing demonstrations of large airframe structures. Complete low cost attritable aircraft flight demonstration analysis and support. Continue structural life extension demonstration of legacy fleet metallic structures. Initiate validation tests of life extension and durability methods for legacy fleet composite structures in support of aircraft Service Life Extension programs. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.580 million. Justification for the increase is described in the plans above.			
Accomplishments/Planned Programs Subtotals	20.336	26.679	31.969

	FY 2018	FY 2019
Congressional Add: Program increase - aircraft winglets and drag reduction devices	0.000	5.000
FY 2018 Accomplishments: Not Applicable		
FY 2019 Plans: Conduct Congressionally directed efforts		
Congressional Adds Subtotals	0.000	5.000

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 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/ Demo*	Project (Number/Name) 634926 / *High Speed/Hypersonic Intgr and Demo*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
634926: *High Speed/Hypersonic Intgr and Demo*	-	68.376	78.324	48.959	0.000	48.959	21.592	22.031	22.476	22.926	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, integrates and demonstrates, via simulations, ground, and flight tests, advanced flight vehicle technologies that improve the performance and supportability of future high speed/hypersonic vehicles. System level integration brings together air vehicle technologies with avionics, propulsion, and warheads and other aerospace subsystems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: High Speed/Hypersonic Vehicle Technologies	68.376	78.324	48.959
Description: Develop, simulate, and demonstrate integrated vehicle technologies to enable and improve the performance of future high-speed and hypersonic systems. ***FY 2019 Plans:*** Continue accelerated development and demonstration of tactically-relevant long-range high-speed strike technologies including ground and flight demonstrations needed. Initiate and complete Hypersonic Air-breathing Weapon Concept (HAWC) and Tactical Boost Glide (TBG) integration, assembly, test, and checkout. Initiate flight test activities for both HAWC and TBG. ***FY 2020 Plans:*** Continue development and demonstration of tactically-relevant long-range high-speed strike technologies including ground and flight demonstrations needed. Complete Hypersonic Air-breathing Weapon Concept (HAWC) and Tactical Boost Glide (TBG) integration, assembly, test, and checkout. Continue some flight test activities for both HAWC and TBG. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $29.365 million. Funding decreased due to High Speed Strike Weapon (HSSW) work transitioning to flight test.			
Accomplishments/Planned Programs Subtotals	68.376	78.324	48.959

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev/ Demo*	**Project (Number/Name)** 634926 / *High Speed/Hypersonic Intgr and Demo*

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 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/ Demo*	Project (Number/Name) 634927 / *Flight Systems Control*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
634927: *Flight Systems Control*	-	14.411	15.999	22.021	0.000	22.021	24.784	28.123	28.692	29.266	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program integrates and demonstrates advanced control technologies that improve the performance, reliability, safety, and survivability of existing and future, manned and unmanned, aerospace systems. Enhanced capabilities are enabled by control, automation, and system level integration of subsystems and systems such as propulsion, airframes, avionics, power & thermal management, weapons, communications, and operator interfaces. Modeling and simulation, integration, and technology demonstrations in a near-operational environment reduce the risk and time required to transition technologies into existing and future aerospace systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Autonomous Systems Control	14.411	15.999	22.021
Description: Develop, simulate, and demonstrate advanced automation and control-enabled capabilities for manned or unmanned aerospace platforms. Develop, simulate, and demonstrate autonomous flight controls for safe flight and cooperative operations between manned and remotely piloted air platforms. ***FY 2019 Plans:*** Continue development and demonstration of technologies for situational awareness, autonomous control, and survivability for unmanned systems and manned platforms. Continue demonstration of autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems. Continue development and demonstration of airborne control of teams of unmanned aircraft. Continue development and demonstration of reduced crew operations of future mobility aircraft. Continue development of unmanned sense-and-avoid technologies for ground and air operations. Continue development of technologies to reduce risk for transition of collision avoidance technologies to 4th and 5th generation aircraft. Continue development of foundational autonomy for unmanned systems and spiral demonstrations of capability. ***FY 2020 Plans:*** Continue development and demonstration of technologies for situational awareness, autonomous control, and survivability for unmanned systems and manned platforms. Incorporate autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems, airborne control of teams of unmanned aircraft, and unmanned sense-and-avoid technologies for ground and air operations to the autonomy spiral demonstrations. Complete development and demonstration of reduced crew operations of future mobility aircraft. Continue development of technologies to reduce risk for transition of collision avoidance technologies to 4th and 5th-gen aircraft. Continue development of foundational autonomy for unmanned systems and spiral demonstrations of capability, including safe airspace interoperability and sense and avoid for air and ground operations. Initiated spiral autonomy			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev/ Demo*	**Project (Number/Name)** 634927 / *Flight Systems Control*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
demonstration of manned-unmanned teaming capability incorporating the above technology transitions, including pilot-directed autonomous control. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $6.022 million. Funding increased due to additional focus on rapid development and demonstration of autonomy for manned-unmanned teaming.			
Accomplishments/Planned Programs Subtotals	14.411	15.999	22.021

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.