Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603003A *I Aviation Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	165.035	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	165.035
313: *Adv Rotarywing Veh Tech*	-	109.610	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	109.610
436: *Rotarywing MEP Integ*	-	7.192	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.192
447: *ACFT Demo Engines*	-	3.633	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.633
BA7: *AVIATION ADVANCED TECHNOLOGY INITIATIVES (CA)*	-	44.600	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	44.600

Note

In Fiscal Year 2020 (FY20)this Program Element (PE)was realigned with continuity of effort to PE:
* 0603465A Future Vertical Lift Advanced Technology.

A. Mission Description and Budget Item Justification

This PE matures and demonstrates manned and unmanned air vehicle technologies to enable Army aviation modernization. Within this PE, aviation technologies are advanced and integrated into realistic and robust demonstrations. Project 313 matures, demonstrates and integrates enabling component, subsystems and systems in the following areas: rotors and, structures. Project 436 matures, integrates and demonstrates air launched weapons systems, mission equipment packages to enable control of unmanned systems and advanced teaming capabilities. Project 447 matures and demonstrates affordable and efficient engines and drive trains.

Work in this PE contributes to the Army Science and Technology (S&T) Air Systems portfolio and is related to and fully coordinated with PE 0602211A (Aviation Technology), PE 0603313A (Missile and Rocket Advanced Technology), PE 0603710A (Night Vision Advanced technology), and PE 0603270A (Electronic Warfare Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas and the Army Modernization Strategy. Work in this PE is performed by the United States (U.S.) Army Futures Command (AFC).

FY20 realignments are due to financial restructuring in support of the Army Modernization Priorities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army					Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*		R-1 Program Element (Number/Name) PE 0603003A *I Aviation Advanced Technology*			
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	169.411	0.000	0.000	-	0.000
Current President's Budget	165.035	0.000	0.000	-	0.000
Total Adjustments	-4.376	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.376	-			

Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2019**	**FY 2020**
Project: BA7: *AVIATION ADVANCED TECHNOLOGY INITIATIVES (CA)*		
Congressional Add: *Stretch Broken Composite Material Forms*	4.000	-
Congressional Add: *Advanced Helicopter Seating System*	5.000	-
Congressional Add: *Data Refinement and Optimization for Aviation Sustainment*	1.600	-
Congressional Add: *Surface Tolerant Adhesive for Bonded Airframe Structure*	5.000	-
Congressional Add: *Joint Tactical Aerial Supply Vehicle*	3.000	-
Congressional Add: *Rotorcraft Automated Compenent Tracking*	6.000	-
Congressional Add: *Future Vertical Lift (FVL) Research*	20.000	-
Congressional Add Subtotals for Project: BA7	44.600	-
Congressional Add Totals for all Projects	44.600	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603003A / *Aviation Advanced Technology*	Project (Number/Name) 313 / *Adv Rotarywing Veh Tech*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
313: *Adv Rotarywing Veh Tech*	-	109.610	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	109.610

Note

In Fiscal Year (FY) 2020, this Project is being realigned to:
Program Element (PE) 0603465A Future Vertical Lift Advanced Technology:
* Project AI4 Joint Multi-Role (JMR) Demonstration Advanced Tech
* Project AI6 Next Gen Tactical UAS TD Advanced Technology
* Project AJ3 Next Generation Rotorcraft Transmission Adv Tech
* Project AJ5 Digital Vehicle Management & Control Advanced Tech
* Project AJ7 Advanced Rotors Advanced Technology
* Project AJ9 Integ Mission Equipment for Vert Lift Systems Adv Tech
* Project AK3 Aviation Survivability Advanced Technology
* Project AK8 Air Launched Effects Advanced Technology
* Project AL6 Degraded Visual Environment Mitigation (DVE-M) Adv Tech
* Project AM3 Aircraft and Aircrew Protection Advanced Tech

A. Mission Description and Budget Item Justification

This Project matures, demonstrates and integrates components, subsystems and systems for vertical lift and unmanned air systems that provide improved aircraft and occupant survivability, reduced maintenance and sustainment costs, and greater performance through improved rotors, drives, vehicle management systems and platform design and structures. Systems demonstrated include rotors and robust airframe structures. A major effort in this Project is the Joint Multi-Role (JMR) Technology Demonstrator (TD) in support of the Future Vertical Lift (FVL) family of aircraft.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering Science and Technology focus areas and the Army Modernization Strategy.

Work in this Project is coordinated with Program Executive Office Aviation (PEO Aviation) and PEO Intelligence, Electronic Warfare, and Sensors (PEO IEW&S).

FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Platform Design & Structures Systems	80.337	-	-
Description: Provide demonstration of FVL platform configurations that address multi domain battle capability needs. Determine optimum vehicle attributes that meet future force capability needs for increased system speed, range, payload, and reduced			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603003A / *Aviation Advanced Technology*	**Project (Number/Name)** 313 / *Adv Rotarywing Veh Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
operating costs, to inform and reduce future aviation materiel acquisitions. Flight demonstrate operational capabilities of technology demonstrators.			
Title: Rotors & Vehicle Management Systems ***Description:*** This effort demonstrates the performance benefits of advanced rotors through the assessment of alternative designs aimed to satisfy future force capability needs for increased system durability, speed, range and payload. This effort also integrates advanced flight controls with real-time aircraft state information into vehicle management systems to enable safe, low-effort maneuvering and real-time adaptation to aircraft state changes (degradation, damage, mission, etc.)	1.292	-	-
Title: Rotorcraft Drive Systems ***Description:*** This effort demonstrates advanced rotorcraft drive technologies with the potential to: increase the horsepower-to-weight ratio; reduce drive system noise; reduce production, operating and support costs; and provide automatic component impending failure detection. The drive system demonstrators for this effort will be applicable to FVL platforms.	1.037	-	-
Title: Survivability for Degraded Visual Environment (DVE) Operations ***Description:*** Develop and mature advanced sensor cueing and flight controls to provide ability to maintain terrain and obstacle situational awareness during all DVEs both aircraft induced (brown-out & white-out) and environmentally induced (fog, rain, snow etc.) Flight testing on fleet aircraft is an integral component of the demonstration. Work in this area is being done in coordination with efforts at United States (U.S.) Army Communications-Electronics Research, Development, and Engineering Center (CERDEC), PE 0603710A (Night Vision Advanced Technology). The program presents an opportunity to North Atlantic Treaty Organization (NATO) nations, global industry, and academia to participate with their own assets in order to foster information exchange and collaboration.	16.377	-	-
Title: Aircraft & Occupant Survivability Systems ***Description:*** This effort increases rotorcraft survivability by reducing platform signatures, providing the means to more efficiently counter enemy detection and tracking systems, and also increases protection to the aircraft and aircrew against ballistic munitions, crash landings, and post-crash fire events. This effort enhances air crew situational awareness, allowing manned/unmanned aircraft to avoid enemy air threats.	7.532	-	-
Title: Next Generation Tactical UAS Technology Demonstration (NGTUAS) ***Description:*** Develop and demonstrate transformational air vehicle technologies that overcome key barriers to meet the Army?s future Unmanned Aircraft System (UAS) performance, survivability, and reliability requirements and operational capabilities. Work	2.888	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603003A / *Aviation Advanced Technology*	**Project (Number/Name)** 313 / *Adv Rotarywing Veh Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
in this area is being done in coordination with efforts at the Aviation and Missile Research, Development, and Engineering Center (AMRDEC) PE 0602211A (Aviation Technologies).			
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun ***Description:*** FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.147	-	-
Accomplishments/Planned Programs Subtotals	109.610	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603003A / *Aviation Advanced Technology*	Project (Number/Name) 436 / *Rotarywing MEP Integ*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
436: *Rotarywing MEP Integ*	-	7.192	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.192

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
Program Element (PE) 0603465 Future Vertical Lift Advanced Technology
* Project AL1 Adv Teaming for Tactical Aviation Oper Adv Tech

A. Mission Description and Budget Item Justification

This Project matures and validates man-machine integration and mission equipment software and hardware technologies for unmanned and optionally manned aircraft systems and integrated threat protection systems. Efforts focus on artificial intelligence, intelligent agents, cognitive decision aiding, sensors, avionics, communications, and pilot vehicle interfaces. This Project improves the overall mission execution by demonstrating manned and unmanned system teaming, enhanced aircraft pilotage capability, improved crew workload distribution, and new capabilities for both manned and unmanned aircraft. This Project supports Army transformation by providing mature technology to greatly expand the capabilities of unmanned aircraft, in current operating roles and future unmanned wingman roles.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology focus areas and the Army Modernization Strategy.

FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Unmanned and Optionally Manned Systems	5.674	-	-
Description: Mature and apply tactical behavior algorithms and safe-flight technologies to enable unmanned and optionally manned aircraft to maintain safe, responsive, flexible, and tactical formation flight with manned helicopters for unmanned wingman applications in re-supply, reconnaissance, surveillance and attack missions. Develop, mature, apply, and integrate advanced decision aiding, autonomy, and human-machine interface technologies to enable the helicopter flight crew to make full use of the capabilities of an unmanned aircraft system (UAS) without requiring continuous attention. Efforts include development of intelligent algorithms that aid decisions and actions in order to increase situation awareness, maximize use of on-board and off-board sensors, efficiently manage a team of manned and unmanned vehicles and their mission systems, and develop and execute effective and appropriate offensive and defensive responses.			
Title: Advanced Teaming	1.518	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603003A / *Aviation Advanced Technology*	**Project (Number/Name)** 436 / *Rotarywing MEP Integ*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Develop and demonstrate teaming behaviors and autonomous decision making for mixed platform formations in combined arms operations. Focus areas include: resilient autonomous algorithms; self-organizing unmanned formations; distributed command and control; and navigation.			
Accomplishments/Planned Programs Subtotals	7.192	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603003A / *Aviation Advanced Technology*	Project (Number/Name) 447 / *ACFT Demo Engines*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
447: *ACFT Demo Engines*	-	3.633	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.633

Note

In Fiscal Year (FY) 2020, this Project is being realigned to:
Program Element (PE) 0603465A Future Vertical Lift Advanced Technology
* Project AI8 Alternative Concept Engine Advanced Technology
* Project AJ1 Future UAS Engine Advanced Technology

A. Mission Description and Budget Item Justification

This Project matures and demonstrates power system technologies through design, fabrication, and evaluation of advanced engine components in order to improve the performance of turbine engines and drive systems for vertical lift aircraft and Unmanned Aerial Systems (UAS) vehicles This Project supports Army modernization by demonstrating mature technologies for lighter turbine engines and drives that provide increased power, increased fuel efficiency, improved sustainability and reduced maintenance. These advanced engine designs and drives will significantly improve the overall aircraft performance characteristics and reduce the logistical footprint of Army Aircraft.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology focus areas and the Army Modernization Strategy.

FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Alternative Concept Engine (ACE)	3.633	-	-
Description: This effort demonstrates alternative, adaptive, and intelligent engine technologies to provide improved / mission-optimized performance, readiness, and affordability across an expanding engine envelope for increased operational capability for Army Aviation manned and unmanned platforms. The alternative concept engine technology demonstrations planned for this effort are applicable to current and future platforms. Work in this project is coordinated with efforts in PE 0602211A (Aviation Technology) / Project 47A (AERON & ACFT Wpns Tech).			
Accomplishments/Planned Programs Subtotals	3.633	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603003A / *Aviation Advanced Technology*	**Project (Number/Name)** 447 / *ACFT Demo Engines*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603003A / *Aviation Advanced Technology*	Project (Number/Name) BA7 / *AVIATION ADVANCED TECHNOLOGY INITIATIVES (CA)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BA7: *AVIATION ADVANCED TECHNOLOGY INITIATIVES (CA)*	-	44.600	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	44.600

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Aviation advanced technology development.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Stretch Broken Composite Material Forms	4.000	-
FY 2019 Accomplishments: Stretch Broken Composite Material Forms		
Congressional Add: Advanced Helicopter Seating System	5.000	-
FY 2019 Accomplishments: Advanced Helicopter Seating System		
Congressional Add: Data Refinement and Optimization for Aviation Sustainment	1.600	-
FY 2019 Accomplishments: Data Refinement and Optimization for Aviation Sustainment		
Congressional Add: Surface Tolerant Adhesive for Bonded Airframe Structure	5.000	-
FY 2019 Accomplishments: Surface Tolerant Adhesive for Bonded Airframe Structure		
Congressional Add: Joint Tactical Aerial Supply Vehicle	3.000	-
FY 2019 Accomplishments: Joint Tactical Aerial Supply Vehicle		
Congressional Add: Rotorcraft Automated Compenent Tracking	6.000	-
FY 2019 Accomplishments: Rotorcraft Automated Compenent Tracking		
Congressional Add: Future Vertical Lift (FVL) Research	20.000	-
FY 2019 Accomplishments: Future Vertical Lift (FVL) Research		
Congressional Adds Subtotals	44.600	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603003A / *Aviation Advanced Technology*	**Project (Number/Name)** BA7 / *AVIATION ADVANCED TECHNOLOGY INITIATIVES (CA)*

D. Acquisition Strategy

N/A