Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift 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	-	0.000	98.359	96.484	-	96.484	96.734	85.121	85.418	85.737	0.000	547.853
AI5: *Next Gen Tactical UAS TD Technology*	-	0.000	0.000	7.569	-	7.569	7.661	8.226	8.332	8.333	0.000	40.121
AI7: *Alternative Concept Engine Technology*	-	0.000	3.657	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.657
AI9: *Future UAS Engine Technology*	-	0.000	2.888	3.051	-	3.051	3.224	3.369	3.484	3.519	0.000	19.535
AJ2: *Next Generation Rotorcraft Transmission Technology*	-	0.000	4.045	4.122	-	4.122	4.205	1.449	1.465	1.465	0.000	16.751
AJ4: *Digital Vehicle Management and Control Technology*	-	0.000	4.816	6.458	-	6.458	6.587	5.720	4.796	4.796	0.000	33.173
AJ6: *Advanced Rotors Technology*	-	0.000	2.362	2.420	-	2.420	2.478	2.530	2.533	2.558	0.000	14.881
AJ8: *Experimental and Computational Aeromechanics Techn*	-	0.000	5.185	5.269	-	5.269	6.211	6.450	6.625	6.691	0.000	36.431
AK1: *UAS Survivability Technology*	-	0.000	1.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.000
AK2: *Aviation Survivability Technology*	-	0.000	21.792	21.233	-	21.233	22.113	21.545	21.799	21.801	0.000	130.283
AK4: *Multi-Role Small Guided Missile Technology*	-	0.000	6.104	7.692	-	7.692	8.418	0.000	0.000	0.000	0.000	22.214
AK6: *Advanced Rotorcraft Armaments Protection System Te*	-	0.000	5.313	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.313
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	0.000	13.583	13.764	-	13.764	12.416	12.439	12.604	12.730	0.000	77.536

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army												Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*							
AL2: *High Performance Computing for Rotorcraft App Tech*	-	0.000	1.169	1.191	-	1.191	1.215	1.239	1.253	1.266	0.000	7.333
AL4: *High Speed and Efficient VTOL Vehicle Technology*	-	0.000	1.500	1.499	-	1.499	1.499	1.529	1.546	1.546	0.000	9.119
AL5: *Air Vehicle Structures and Dynamics Technology*	-	0.000	2.766	2.824	-	2.824	2.887	2.945	2.978	3.008	0.000	17.408
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	0.000	1.745	1.783	-	1.783	1.819	1.855	1.877	1.896	0.000	10.975
AM2: *Aircraft and Aircrew Protection Technology*	-	0.000	1.522	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.522
AM4: *Opt Energy Stg & Therm Mgmt for FVL Survivability*	-	0.000	4.912	8.674	-	8.674	7.356	7.533	7.634	7.635	0.000	43.744
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	0.000	14.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.000
BZ7: *Future Vertical Lift Medical Technologies*	-	0.000	0.000	8.211	-	8.211	8.195	8.292	8.492	8.493	0.000	41.683
CC3: *FVL Radar Technologies*	-	0.000	0.000	0.724	-	0.724	0.450	0.000	0.000	0.000	0.000	1.174

Note

In Fiscal Year (FY) 2020, this Program Element (PE) is realigned with continuity of effort from the following PEs:
* PE 0602120A Sensors and Electronic Survivability
* PE 0602211A Aviation Technology
* PE 0602270A Electronic Warfare Technology
* PE 0602303A Missile Technology
* PE 0602624A Weapons and Munitions Technology
* PE 0602705A Electronics and Electronic Devices
* PE 0602709A Night Vision Technology

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 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602148A *I Future Verticle Lift Technology*

A. Mission Description and Budget Item Justification

This PE conducts air vehicle and mission system component design, fabrication, and evaluation to enable Army Future Vertical Lift. Emphasis is on developing aviation platform and mission system technologies to enhance manned and unmanned air vehicle combat and combat support operations for attack, reconnaissance, air assault, survivability, logistics, and command and control missions.

Work in this PE contributes to the Army Science and Technology (S&T) air systems portfolio and is fully coordinated with efforts in PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 Army Futures Command (AFC) and the Army Engineering Research and Development Center (ERDC).

All FY20 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	93.601	88.903	-	88.903
Current President's Budget	0.000	98.359	96.484	-	96.484
Total Adjustments	0.000	4.758	7.581	-	7.581
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-9.242			
• Congressional Rescissions	-	-			
• Congressional Adds	-	14.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	7.581	-	7.581

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: BP7: *Future Vertical Lift Air Platform Tech (CA)*		
Congressional Add: *Flight Control Technology Safety and Survivability*	-	3.000
Congressional Add: *Rotary Wing Adaptive Flight Control Technology*	-	6.000
Congressional Add: *Technology Transfer and Innovation*	-	5.000
Congressional Add Subtotals for Project: BP7	-	14.000
Congressional Add Totals for all Projects	-	14.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AI5 / *Next Gen Tactical UAS TD 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
AI5: *Next Gen Tactical UAS TD Technology*	-	0.000	0.000	7.569	-	7.569	7.661	8.226	8.332	8.333	0.000	40.121

Note

Funding in this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech

The FY20 funding requested in this Project was Marked in the FY20 Appropriation Conference Report.

A. Mission Description and Budget Item Justification

This Project utilizes improved computer modeling fidelity to investigate the effects that potential Future Unmanned Aircraft System (FUAS) capabilities could have on air vehicle design considerations and operational concepts. This project improves government capability to design and assess novel Unmanned Aircraft System (UAS) concepts . This Project develops and investigates the ability to launch a UAS from a manned or unmanned future vertical lift aircraft at tactical altitudes and to control the UAS from the cockpit or a crew station. This Project will assess the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Systems Concepts Studies for Air Launched Effects	-	-	7.569
Description: Investigates and models air vehicle concepts to understand the effects that potential operational Air Launched Effects capabilities will have on air vehicle properties.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AI5 / *Next Gen Tactical UAS TD Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will investigate and model the effect that overwatch, decoy, and electronic warfare capabilities will have on unmanned air vehicle designs including size, weight, system performance, power, survivability, and unit cost; will develop and assess concept air and ground launch vehicle designs to support reconnaissance, surveillance, electronic warfare, and lethal attack. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** FY21 funding increase in this Project results from Congressional language that eliminated Next Gen Tactical Unmanned Aircraft System (UAS) funding in FY20.			
Accomplishments/Planned Programs Subtotals	-	-	7.569

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AI7 / *Alternative Concept Engine 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
AI7: *Alternative Concept Engine Technology*	-	0.000	3.657	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.657

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology:
* Project 47A Aeron & ACFT Wpns Tech

In FY21 this Project is realigned to:
PE 0602148A Future Verticle Lift Technology
* Project AM4 Opt Energy Stg & Therm Mgmt for FVL Survivability

A. Mission Description and Budget Item Justification

This Project develops Future Vertical Lift (FVL) engine component technologies that could significantly improve platform performance, reliability, and operational capability.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Alternative Concept Engine Technology	-	3.491	-
Description: Design and evaluate advanced turboshaft engine component technologies to support goals of reduced fuel consumption, engine size, weight, and cost, as well as improved reliability and maintainability.			
FY 2020 Plans: Alternative concept engine component development will be completed by validating compressor, combustor and turbine technology.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AI7 / *Alternative Concept Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
In FY21, this Project is realigned to PE 0602148A (Future Vertical Lift Technology) / AM4 (Opt Energy Stg & Therm Mgmt for FVL Survivability).			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.166	-
Accomplishments/Planned Programs Subtotals	-	3.657	-

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AI9 / *Future UAS Engine 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
AI9: *Future UAS Engine Technology*	-	0.000	2.888	3.051	-	3.051	3.224	3.369	3.484	3.519	0.000	19.535

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology:
* Project 47B Veh Prop & Struct Tech

A. Mission Description and Budget Item Justification

This Project designs and evaluates current and Future Unmanned Aircraft Systems (FUAS) advanced engine/power system component technologies to support the goals of multi-fuel capability, reduced fuel consumption, engine size, weight, and cost, as well as improved reliability, survivability, and maintainability.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Multi-fuel Capable Hybrid Electric Propulsion	-	2.757	3.051
Description: Applied research to enable intelligent and robust propulsion performance and noise signature reduction via multi-fuel and optimized hybrid electric capability for small engines (20kW to 150kW) powering future aircraft systems. The research focuses on the establishment of concepts to enable reduced fuel consumption, engine size, weight, and cost as well as improved group 3 and 4 FUAS reliability, survivability, and maintainability.			
FY 2020 Plans: Will establish research in assisted ignition technology and explore methodologies for robust combustion control. Will initiate research in hybrid-electric component optimization, thermal management analysis, advanced radial turbomachinery assessment, and additive-manufacturing for turbomachinery and high-temperature reaction chamber components.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AI9 / *Future UAS Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will design and develop robust energy assistance probe and controls, and real-time fuel property detection technology. The energy assistance probe will assist with combustion instability derived from low ignition quality fuels. Will validate improved turbocharger designs to minimize identified resonances and thrust oil-less bearing. Will investigate thermal and power management module in the hybrid-electric tool for the optimization and integration of engine power plants and high-performance electric machines to enable efficient delivery and management of power in Army unmanned air vehicles. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.131	-
Accomplishments/Planned Programs Subtotals	-	2.888	3.051

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ2 / *Next Generation Rotorcraft Transmission 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
AJ2: *Next Generation Rotorcraft Transmission Technology*	-	0.000	4.045	4.122	-	4.122	4.205	1.449	1.465	1.465	0.000	16.751

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech.

A. Mission Description and Budget Item Justification

This Project investigates Future Vertical Lift (FVL) advanced drive train technologies that increase performance and double current drivetrain life cycles while improving their reliability and maintainability.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Next Generation Rotorcraft Transmission Technology	-	3.862	-
Description: Design and evaluate advanced drive system component technologies to support Variable multi-speed (50-100%), while doubling current transmission life cycles and improving platform reliability and maintainability. ***FY 2020 Plans:*** Will investigate innovative methods to achieve variable speed such as elliptical drive technologies. Variable speed component fabrication and testing will be completed. This effort will inform a full transmission demonstrator for FVL. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21 this effort is realigned to the High Reduction Ratio Transmission (HRT) Components effort in this Project.			
Title: High Reduction Ratio Transmission Components	-	-	4.122

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ2 / *Next Generation Rotorcraft Transmission Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Effort investigates advanced materials and component designs that allow a 60:1 reduction ratio two-stage gearbox design that provides significant weight and volume reduction for extended range and component life for manned and unmanned applications. ***FY 2021 Plans:*** Will investigate new materials that allow higher contact stresses to enable high-reduction ratio gears that operate at high speeds. Will use the materials selected for development of component designs for HRT. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding for this effort is realigned in FY21 from Next Generation Rotorcraft Transmission Technology effort in this Project.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.183	-
Accomplishments/Planned Programs Subtotals	-	4.045	4.122

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 / 2					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*				Project (Number/Name) AJ4 / *Digital Vehicle Management and Control 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**
AJ4: *Digital Vehicle Management and Control Technology*	-	0.000	4.816	6.458	-	6.458	6.587	5.720	4.796	4.796	0.000	33.173

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology:
* Project 47A Aeron & ACFT Wpns Tech

A. Mission Description and Budget Item Justification

This Project investigates potential manned Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) fly-by-wire & fly-by-light rotor/flight control and autonomy for active rotor and compound concepts. It also investigates, matures, and harmonizes leap-ahead autonomy, structures, and controls technologies, concepts, and capabilities which enable combat mission success across the family of manned/unmanned FVL platforms.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Digital Vehicle Management & Control Technology	-	4.597	-
Description: Investigate manned and unmanned advanced rotor/flight control concepts and vehicle management technologies focused on advanced aircraft configurations and complex missions. This effort will develop handling qualities requirements, mature simulation and optimization methods, and support goals of improved robustness, reduced weight, and collaborative teaming of FVL and FUAS platforms.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ4 / *Digital Vehicle Management and Control Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will complete fabrication of hardware components and will complete development of software for a new Research Flight Control Computer Assembly and associated Test Bench and Ground Test Unit. Will begin installation and testing of this new hardware into the Rotorcraft Aircrew Concept Airborne Laboratory (RASCAL) development facility and into the RASCAL test aircraft. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is realigned in FY21 to the Adaptive and Resilient Tactical Autonomy, Controls, and Structures (ARTACS) Tech effort in this Project.			
Title: Adaptive and Resilient Tactical Autonomy, Controls, and Structures Tech ***Description:*** Develop autonomy, controls, and structures technologies to ensure mission success for manned/unmanned, multiple capability set Future Vertical Lift platforms in the contested environment of multi-domain operations. ***FY 2021 Plans:*** Will develop structural dynamics analytical tool enhancements based on more accurate analytical prediction of rotorcraft internal structural loads. Will develop adaptive, weight-efficient structural concepts enabling on-the-fly configuration adaptation for near-optimal performance across various flight conditions. Will apply validated, full-flight-envelope simulation methods to Future Vertical Lift configurations. Will develop mission-adaptive and damage tolerant control technologies aimed at advanced configurations with redundant controls. Will develop agility and maneuverability criteria, response types, and mission task elements for high speed. Will improve the functionality and robustness of autonomy algorithms and develop machine-learning-augmented technologies to enhance autonomous and optionally piloted flight operations, including the preservation of vehicle and mission capability. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is realigned in FY21 from PE 0602148 (Future Vertical Lift Technology) / AM2 (Aircraft and Aircrew Protection Technology) as well as the Digital Vehicle Management and Control Technology effort in this Project.	-	-	6.458
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.219	-
Accomplishments/Planned Programs Subtotals	-	4.816	6.458

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ4 / *Digital Vehicle Management and Control Technology*

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ6 / *Advanced Rotors 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
AJ6: *Advanced Rotors Technology*	-	0.000	2.362	2.420	-	2.420	2.478	2.530	2.533	2.558	0.000	14.881

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech.

A. Mission Description and Budget Item Justification

This Project investigates Future Vertical Lift (FVL) technologies that mature high speed and highly efficient rotor and hub system designs.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Advanced Rotors Technology	-	2.255	2.420
Description: Investigate advanced rotor blade and hub technologies to support goals of increased speed and reduced drag by developing low weight rotors and hub configurations that increase hover and cruise efficiency. ***FY 2020 Plans:*** Will conduct design trades studies and technology bench tests to start technology down-selection for integrated high speed, highly efficient rotor system. Will commence conceptual design studies of the rotor system. ***FY 2021 Plans:*** Will conduct individual blade control actuator performance and thermal management testing. Will investigate durability performance of Unmanned Aerial Systems (UAS) rotors to determine robustness ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY 2020 SBIR/STTR Transfer	-	0.107	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ6 / *Advanced Rotors Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	2.362	2.420

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ8 / *Experimental and Computational Aeromechanics Techn*	

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
AJ8: *Experimental and Computational Aeromechanics Techn*	-	0.000	5.185	5.269	-	5.269	6.211	6.450	6.625	6.691	0.000	36.431

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech.

A. Mission Description and Budget Item Justification

This Project investigates new high fidelity computational methods to simulate aerodynamic effects and test methods of emerging rotorcraft lift technologies that could be incorporated into Future Vertical Lift (FVL) designs.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 effort is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Experimental Aeromechanics for FVL	-	2.919	3.020
Description: Develop and explore new methods to simulate aerodynamic effects for future FVL configurations.			
FY 2020 Plans: Will continue experimental investigation of interactional aerodynamic phenomena affecting the flow field and performance of winged-compound configurations; will conduct experimental efforts aimed at extending the state of the art for flow measurement & diagnostics techniques such as blade deformation measurement using digital image correlation, wake flow field measurements using particle image velocimetry, and laminar-to-turbulent transition measurement using pioneering infra-red thermography techniques. Will examine interactional aerodynamic effects on of multi-rotor configurations.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ8 / *Experimental and Computational Aeromechanics Techn*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will leverage results from FY20 research to perform interactional aerodynamic investigation of winged-compound configurations incorporating auxiliary propulsion. Will investigate interactional aerodynamic effects of multi-rotor configurations. Will continue experimental efforts aimed at extending the state of the art for measurement & diagnostics techniques for rotor blade structural deformation using embedded sensor networks and digital image correlation, wake flow measurements using advanced optical techniques. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Computational Aeromechanics for FVL ***Description:*** Investigate experimental aeromechanics technologies and test methods for FVL. ***FY 2020 Plans:*** Will automate the computational workflows and problem setup for high-fidelity computations that simulate the aerodynamics and structural dynamics of future vertical lift systems. Will adapt high-fidelity computational simulations to improve accuracy and optimize their computational efficiency on new and emerging high-performance computer architectures. ***FY 2021 Plans:*** Will verify and validate high-fidelity computational tools for full-vehicle aeromechanics analysis of FVL rotorcraft engineering problems. Will use these computational tools to help reduce expensive and time-consuming flight testing to rectify unforeseen deficiencies in new FVL aircraft. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	-	2.030	2.249
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.236	-
Accomplishments/Planned Programs Subtotals	-	5.185	5.269

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 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AJ8 / *Experimental and Computational Aeromechanics Techn*

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK1 / *UAS Survivability 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
AK1: *UAS Survivability Technology*	-	0.000	1.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.000

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech

In FY21 this Project is realigned to:
PE 0603465A Future Vertical Lift Advanced Technology
* Project AK3 Aviation Survivability Advanced Technology

A. Mission Description and Budget Item Justification

This Project investigates Future Unmanned Aircraft System (FUAS) with mission tailored survivability capabilities that enable operations in contested environments against future peer/near peer threats.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Unmanned Aerial Systems Survivability	-	0.954	-
Description: Investigate innovative methods to design FUAS with tailored signature management and enhanced survivability.			
FY 2020 Plans: Will perform trade studies for identification of FUAS specific susceptibility and vulnerability attributes. Will develop tailored signature management for FUAS applications missions; survivability-enhanced mission profiles; team-based survivability behaviors; and electronic warfare-resilient systems and architectures.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK1 / *UAS Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding is realigned in FY21 to PE 0603465A (Aviation Advanced Technology) / AK3 (Aviation Survivability Advanced Technology) because technology is maturing faster than anticipated.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.046	-
Accomplishments/Planned Programs Subtotals	-	1.000	-

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK2 / *Aviation Survivability 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
AK2: *Aviation Survivability Technology*	-	0.000	21.792	21.233	-	21.233	22.113	21.545	21.799	21.801	0.000	130.283

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology:
* Project 47A Aeron & ACFT Wpns Tech
PE 0602270A Electronic Warfare Technology:
* Project 906 Tactical Electronic Warfare Applied Research
PE 0602624A Weapons and Munitions Technology:
* Project H28 Warheads/Energetics Technology
PE 0602705A Electronics and Electronic Devices:
* Project H94 (Elec & Electronic Dev
PE 0602709A Night Vision Technology:
* Project H95 Night Vision and Electro-Optic Technology

A. Mission Description and Budget Item Justification

This Project investigates advanced technologies to reduce Future Vertical Lift (FVL) platform susceptibility and vulnerability to damage from guided and unguided threats, as well as technologies to defeat small arms, rocket and missile threats. It also investigates and develops an integrated team-based system of systems survivability approach for Integrated Air Defense Systems breaching through purpose driven mix of improved survivability situational awareness, signature management, vulnerability reduction, route and maneuver optimization, expendables, advanced sensors, and Electro-optical (EO) & Radio Frequency (RF) jamming across distributed platforms.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Signature Reduction for Advanced Threat	-	3.887	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK2 / *Aviation Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Investigate advanced technologies to reduce susceptibility and vulnerability of aircraft to damage from threats or accidents, as well as technologies to defeat small arms, rocket, and missile threats. ***FY 2020 Plans:*** Will complete an adaptive Infrared (IR) engine suppression system for FVL aircraft in an engine test cell to evaluate engine and IR suppression performance. Will develop signature management technologies. Will complete evaluation of holistic survivability technology solutions through integrated survivability assessment trade studies for FVL concept aircraft. Will complete the development of modeling and simulation tools to support survivability analysis against advanced threat systems. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21 funding for this effort is realigned to the Advanced Survivability Concepts effort in this Project.			
Title: Cognitive Countermeasures Technology Development ***Description:*** This effort investigates and matures novel materials, components, and techniques to counter legacy and emerging threats to FVL platforms. Emphasis will be placed on technologies and approaches to enable a robust, holistic countermeasure capability for target defeat, regardless of threat characteristics or guidance mode. ***FY 2020 Plans:*** Will investigate spectral and temporal RF signatures associated with legacy and emerging threats, then will develop detection and identification algorithms based on the threat signatures; will investigate ultra-short pulse laser (USPL) detector photo bleaching phenomena and characterize fundamental temporal limits and necessary radiation requirements to produce saturation effects; will investigate novel rare earth-doped low-phonon laser materials; and will design and develop an in-band Midwave Infrared (MWIR) short-pulse laser source with surrogate-diode pumping to be used for direct defeat of unknown future threats. ***FY 2021 Plans:*** Will develop preliminary sensor model for detection of specific targets studied from FY18 - FY20 and validate its performance against select targets; characterize ultra-short pulse Laser Induced Direct Damage (LIDD) of optical materials and detectors for physical and electronic damage/disruption; investigate the previously developed (in FY20) in-band MWIR laser source with surrogate-diode pumping and conduct the required research and development towards major performance optimization. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	-	1.802	1.997
Title: Reconfigurable Transformational Optics/Task based Display ***Description:*** This effort will deliver reconfigurable micro- and nano-scale filtering devices enabling frequency agile multi-task sensors. This will permit enhanced survivability of the FVL platforms with restored visual overmatch in any (day/night)	-	5.955	5.283

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK2 / *Aviation Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
environment. This will allow visual penetration of natural obscurants (e.g. brownout, white out) or custom man-made obscurants (e.g. engineered smokescreens) from a single sensor, as well as narrowband filtering for active imaging through obscurants. Improved detection and identification capability will result from filtering out scattered light and enabling 3-dimensional ranging through environmental obscurants. Wavelength agile imaging systems will be delivered that are capable of penetrating and imaging through a variety of obscurants and that are compatible with the FVL platforms. ***FY 2020 Plans:*** Will investigate tunable filter designs in the midwave and longwave infrared for simultaneous on/off filter switching between broad and narrow bands, and tunability of the filter center wavelength; will validate selected filter designs maintain sufficient throughput. Will model and measure pulsed infrared laser illumination and ranging sources that will be incorporated into filter designs. ***FY 2021 Plans:*** Will design and develop tunable filter designs in the midwave and longwave infrared for simultaneous on/off filter switching between broad and narrow bands, and tunability of the filter center wavelength. Will down select filter designs that maintain sufficient throughput. Will validate pulsed infrared laser illumination and ranging sources that will be incorporated into filter designs. Will design and develop new optical material design concepts to increase damage resistance and minimize lens count. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding decreased in FY21 to realign to EW Air Sensors / CM effort in this Project.			
Title: Multispectral Threat Warning and Countermeasures ***Description:*** This effort investigates and evaluates software and warning sensor/counter measure components to increase probability to detect and defeat current and evolving small arms and man-portable air defense system (MANPADS) type threats for FVL platforms using modeling and simulation (M&S) and hardware in the loop (HWIL) simulations. ***FY 2020 Plans:*** Will investigate tunable filter designs in the midwave and longwave infrared for simultaneous on/off filter switching between broad and narrow bands, and tunability of the filter center wavelength; will validate selected filter designs maintain sufficient throughput. Will model and measure pulsed infrared laser illumination and ranging sources that will be incorporated into filter designs. ***FY 2021 Plans:*** Will investigate the incorporation of distributed sensor data into the threat declaration algorithm; will assess the optimal combination of sensors to perform high detection of multiple classes of unexploited threats; will analyze impact of threat progression on measured performance. ***FY 2020 to FY 2021 Increase/Decrease Statement:***	-	6.856	0.997

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK2 / *Aviation Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding decreased in FY21 to support EW Air Sensors/CM effort in this Project			
Title: Tunable Pyrotechnics Technologies ***Description:*** Develop and investigate technologies for nano, reactive, and advanced/novel materials to enable, customize and ? tune? a family of Countermeasure Decoys for FVL platforms. ***FY 2020 Plans:*** Will develop component technologies for the Dazzler Counter Measure to include new pyrotechnic formulations; will develop and modify Advanced Sensor Counter Measure (ASCM) formulations based on static and functional tests to assess viability of technology candidates; will investigate new counter measure designs in the electromagnetic (EM) spectrum to address emerging threats to the FVL platforms. ***FY 2021 Plans:*** Will investigate novel countermeasure designs and miniaturize component technologies for Radio Frequency performance in the EM spectrum to address emerging threats for current and future aviation platforms; develop and assess the performance of new pyrotechnic formulations for Advanced Seeker Countermeasures through static and functional experiments. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	-	2.302	2.622
Title: Advanced Survivability Concepts ***Description:*** This effort will provide analysis of the rapidly evolving and emerging threat environment and impacts to FVL platforms. This effort will also provide advanced teaming algorithms for survivability. ***FY 2021 Plans:*** Define integrate team survivability capability requirements. Perform preliminary research on full spectrum susceptibility and vulnerability reduction technologies that enhance team based survivability. Begin investigation into team based algorithms and behaviors for survivability. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding for this effort is realigned in FY21 from the Signature Reduction for Advanced Threat effort in this Project	-	-	4.163
Title: EW Air Sensors / CM ***Description:*** This effort investigates and develops Electronic Warfare (EW) survivability technologies to enable the detection and defeat of advanced threats. It provides algorithms, sensors, and effectors that are robust to advanced threat characteristics and operate effectively across the distributed team of FVL aircraft.	-	-	6.171

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK2 / *Aviation Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 Plans: Will research technical approaches to detect and defeat advanced threat characteristics; will develop technical design for detection and defeat technology incorporating advanced signal processing features; will create digital and hybrid hardware models of advanced sensor and countermeasure (CM) payload and analyze functionality. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding for this task is realigned in FY21 from Reconfigurable Transformational Optics/Task based Display effort in this Project.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.990	-
Accomplishments/Planned Programs Subtotals	-	21.792	21.233

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK4 / *Multi-Role Small Guided Missile 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
AK4: *Multi-Role Small Guided Missile Technology*	-	0.000	6.104	7.692	-	7.692	8.418	0.000	0.000	0.000	0.000	22.214

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303A Missile Technology
* Project 214 Missile Technology.

A. Mission Description and Budget Item Justification

The Project investigates, designs, and evaluates modular missile component technologies compatible with Future Vertical Lift (FVL) and Future Unmanned Aircraft Systems (FUAS) aviation platforms in a Multi-Domain Battle/Cross-domain Maneuver operational environment. Also investigates critical component technologies and designs for future missiles that can be launched simultaneously, can operate autonomously and/or under human supervision, and can form advanced, cooperative teams to defeat one or more hard/soft targets which are stationary and/or moving.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Modular Missile Technology	-	1.565	-
Description: Evaluate critical technology and designs components compatible with Manned and Unmanned Aviation environments to provide scalable and tailorable improved lethality. Provides open architecture external and internal interfaces. ***FY 2020 Plans:*** Will mature and validate modular missile technology subsystems and open system architecture and verify subsystem performance for the forward firing variant in bench-level and laboratory environments. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort completes in FY20.			
Title: Multi-Role Guided Missile - Extended Range Technology	-	4.262	4.496

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK4 / *Multi-Role Small Guided Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Design, integrate, and investigate critical technologies that provide an aviation and ground launched maneuverable, loitering missile capability with endurance to achieve extended ranges; a man-in-the-loop for situational awareness and targeting lethal effects against hard armor and other high-value targets; communications that are not easily detectable or jammed; and that are effective in a Multi-Domain Battle/Cross-domain Maneuver operational environment. ***FY 2020 Plans:*** Will investigate missile system level and aviation platform interface requirements and conduct trade studies. Determine missile FVL and FUAS design architecture to include integration of Single Multi-Mission Attack Missile (SMAM) critical components matured under FY20 PE 0603464A (Long Range Precision Fires Advanced Technology / Project AH3 (Single Multi-mission Attack Missile Adv Tech). ***FY 2021 Plans:*** Will develop form factors and interfaces for critical components including navigation sensors, warheads, fire control, and digital missile datalinks. Will complete preliminary integrated missile system design; will perform stand-alone experiments with component technology hardware and software to verify performance; will perform experiments to determine adequate operation in a lab environment. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle for this effort.			
Title: Multiple Simul Engagement Technologies (MSET) ***Description:*** Investigate critical missile and fire control component technologies and designs for future missiles that can be launched simultaneously, can operate autonomously and/or under human supervision, and can form advanced, cooperative teams to defeat one or more hard/soft targets which are stationary and/or moving ***FY 2021 Plans:*** Will perform detailed design of target detection and tracking algorithms, multi-missile communications datalink, and multi-missile command and control algorithms; will develop laboratory environment for component experimentation and perform investigations of component technical performance. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is realigned in FY21 from PE 0602147A (Long Range Precision Fires Technology) / AG9 (Multiple Simul Engagement Technologies (MSET) Tech).	-	-	3.196
Title: FY 2020 SBIR/STTR Transfer	-	0.277	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK4 / *Multi-Role Small Guided Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	6.104	7.692

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK6 / *Advanced Rotorcraft Armaments Protection System Te*	

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
AK6: *Advanced Rotorcraft Armaments Protection System Te*	-	0.000	5.313	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.313

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0602624A Weapons and Munitions Technology
* Project H18 Weapons & Munitions Technologies

In FY21 this Project is realigned to:
PE 0603465A Future Vertical Lift Advanced Technology
* Project AK7 Adv Rotorcraft Armaments Protection Sys Adv Tech
* Project CA8 Adv Rotocraft Armaments Protection Sys

A. Mission Description and Budget Item Justification

This Project investigates holistic lethality technologies for Future Vertical Lift (FVL) offensive and defensive applications. Develops components for use in multi-role armament solutions for fire control, armament systems, munitions, and integration of threat agnostic countermeasures.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 effort is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Advanced Rotorcraft Armament & Protection System (ARAPS)	-	5.072	-
Description: The ARAPS effort designs and develops FVL technologies for lightweight armament systems and multi-role munitions with enhanced lethality at extended ranges. The effort investigates and determines the feasibility of a holistic fire control system that integrates all aspects of offensive and defensive capabilities for advanced protection and enhanced survivability.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK6 / *Advanced Rotorcraft Armaments Protection System Te*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will investigate integrated armament and advanced protection designs for FVL offensive and defensive applications; will design critical component technologies in order to develop advanced lethality and survivability capabilities in fire control, weapon systems, munitions and countermeasures; will investigate system architecture solutions for an integrated armament and advanced protection system. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding realigned in FY21 to PE 0603465A (Future Vertical Lift Advanced Technology / AK7 Adv Rotorcraft Armaments Protection Sys Adv Tech).			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.241	-
Accomplishments/Planned Programs Subtotals	-	5.313	-

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK9 / *Adv Teaming for Tactical Aviation Operations 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
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	0.000	13.583	13.764	-	13.764	12.416	12.439	12.604	12.730	0.000	77.536

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology:
* Project 47A AERON & ACFT Wpns Tech
* Project 47B Veh Prop & Struct Tech

A. Mission Description and Budget Item Justification

This Project investigates and develops subsystem and component level technologies that enable advanced teaming behaviors for mixed platform formations in combined arms operations. Primary component technologies to develop are in the areas of resilient autonomy algorithms, team-based communications and situational awareness management, decision aiding for weapons systems engagement, autonomous terrain and collision avoidance, and human autonomy interface design.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Advanced Teaming Concepts	-	9.468	9.811
Description: Investigates and develops subsystem and component level technologies that enable advanced manned and unmanned teaming behaviors for mixed air and ground platform formations in combined arms operations.			
FY 2020 Plans: Will develop and refine subsystem and component level technologies that enable autonomous manned and unmanned teaming and decision making, including autonomous terrain and collision avoidance, and advanced human autonomy interface designs; adapt and tailor simulation models for technology integration and evaluation.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK9 / *Adv Teaming for Tactical Aviation Operations Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will develop mission systems teaming architectures and subsystem technologies focused on collaborative mission planning and execution, enhanced own-ship autonomy, shared team situational awareness using distributed sensor systems, and advanced effector employment; enhance simulation models for evaluation of multi-Unmanned Aircraft System (UAS) coordinated attack and decoy behaviors in Global Positioning System (GPS) denied conditions. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Micro/Small Scale Unmanned Aerial Systems ***Description:*** Enables micro/small Future Unmanned Aircraft System (FUAS) concepts for experimental prototypes to discover behaviors that can be scaled up to group 3 platforms to support advanced manned and unmanned air and ground teaming, and the maturation of basic research in the area of intelligent unmanned air systems. This includes controls that can adapt to damage or environmental conditions, models to perform aggressive maneuver in complex environments, reduction of noise signature, and adaptive structures. ***FY 2020 Plans:*** Will establish novel control schemes that will enable small unmanned aircraft systems to perform aggressive and energy aware maneuver through complex environments. Will incorporate higher fidelity methods into computationally efficient physics based modeling tools to enhance the design and maneuverability of novel FUAS concepts; this includes the establishment of an acoustics prediction module to enable the design of FUAS with reduced noise signature. Will perform applied research on novel platform concepts to enhance speed, endurance, payload capability, and adaptability. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is realigned in FY21 to the Intelligent Unmanned Aerial System Teaming Technologies effort in this Project.	-	3.499	-
Title: Intelligent Unmanned Aerial System Teaming Technologies ***Description:*** Enables the establishment of component technologies to support resilient, multi-modal, survivable UAS teams that can plan and act on time-scales beyond human capability and have a robust shared understanding of contested and dynamic environments to support effective tactical engagement. Specific topics include 1) novel artificial-intelligence algorithms and methods for adaptive team composition and control, 2) increased team knowledge base and understanding of local and global world models, 3) hierarchical, composable, and adaptive learning methods for increased mission resilience, and 4) understanding interaction and scalability between, amongst, and across heterogeneous team members and the environment. ***FY 2021 Plans:*** Will investigate and develop novel control schemes that will enable homogeneous and heterogeneous groups of UAS to perform advanced teaming operations in complex environments; investigate and mature higher fidelity methods into computationally	-	-	3.953

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK9 / *Adv Teaming for Tactical Aviation Operations Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
efficient physics-based modeling tools to enhance the understanding and effectiveness of tactical group behaviors against a capability-matched adversarial force utilizing game theoretic principles; perform research to progress methods for advanced teaming simulation environments to fully incorporate full vehicle flight dynamics models for a single platform and investigate methods for multi-agents. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort is realigned in FY21 from the Micro/Small Scale Unmanned Aerial Systems effort in this Project.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.616	-
Accomplishments/Planned Programs Subtotals	-	13.583	13.764

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL2 / *High Performance Computing for Rotorcraft App 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
AL2: *High Performance Computing for Rotorcraft App Tech*	-	0.000	1.169	1.191	-	1.191	1.215	1.239	1.253	1.266	0.000	7.333

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A AERON & ACFT Wpns Tech.

A. Mission Description and Budget Item Justification

This Project investigates and validates aeromechanics modeling and simulation tools for Future Vertical Lift (FVL) platforms. Research efforts in this Project are also applicable to the family of FVL manned and unmanned platforms.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: High Performance Computing for Rotorcraft App Tech	-	1.116	1.191
Description: Investigate new high performance and parallel computing efforts in support of FVL platforms.			
FY 2020 Plans: Will investigate accurate, efficient, easy-to-use, and validated aeromechanics modeling and simulation tools based on computational fluid and structural dynamics on high-performance parallel computers.			
FY 2021 Plans: Will develop and demonstrate new automated high-fidelity computational tools for full-vehicle rotorcraft aeromechanics analysis and design. Will automate the setup and execution of these computational models to improve turnaround and to build in best practices for consistently accurate results.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL2 / *High Performance Computing for Rotorcraft App Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Funding change reflects planned lifecycle of this effort.			
Title: FY 2020 SBIR/STTR Transfer	-	0.053	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	1.169	1.191

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL4 / *High Speed and Efficient VTOL Vehicle 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
AL4: *High Speed and Efficient VTOL Vehicle Technology*	-	0.000	1.500	1.499	-	1.499	1.499	1.529	1.546	1.546	0.000	9.119

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47B Veh Prop & Struct Tech.

A. Mission Description and Budget Item Justification

This Project establishes component technologies in the area of materials, design, and dynamic models to enable next generation capability for Future Vertical Lift (FVL) platforms. Objectives of this Project are focused on improving both performance (i.e. range, payload, endurance) and reliability/maintainability metrics, where outcomes from these efforts are applicable to the Family of Future Vertical Lift manned and unmanned platforms.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: High Speed & Efficient Vertical Take-off and Landing	-	1.432	1.499
Description: This research effort establishes concepts in vertical take-off and landing in the area of propulsion to enable improved, efficient hover and high-speed cruise at longer range without added weight.			
FY 2020 Plans: Will conduct research on technologies that will reduce peak transient loads in multi-speed rotorcraft transmission, and perform material modeling of dissimilar materials for hybrid gear technology. Will mature dynamic finite-element/contact analysis modeling for mechanical failure analysis for variable speed transmission and high-temperature material and design component optimization for higher power density.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL4 / *High Speed and Efficient VTOL Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will investigate lightweight materials and designs for transmission gears; establish, by experimental means, the bounds at oil-out conditions for lightweight gear designs. Will characterize and validate the dynamics of candidate hybrid gears. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects the planned lifecycle of this effort.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.068	-
Accomplishments/Planned Programs Subtotals	-	1.500	1.499

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL5 / *Air Vehicle Structures and Dynamics 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
AL5: *Air Vehicle Structures and Dynamics Technology*	-	0.000	2.766	2.824	-	2.824	2.887	2.945	2.978	3.008	0.000	17.408

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47B Veh Prop & Struct Tech).

A. Mission Description and Budget Item Justification

This Project establishes validated modeling tools needed to develop aeroelastically stable rotor technologies to enable high speed flight and longer flight envelopes in Future Vertical Lift (FVL) platforms. Efforts in this Project are also applicable to the family of FVL manned and unmanned platforms.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 effort is performed by the United States (US) Army Futures Command

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Air Vehicle Structures and Dynamics Technology	-	1.704	-
Description: Establish improved experimentally validated modeling tools and methodologies that can be used to understand the physics of aeroelastic stability and design in next generation rotorcraft platform configurations for FVL platforms. This involves the development of an experimental capability, the Tiltrotor Aeroelastic Stability Test-bed (TRAST), which would be used to generate novel experimental data. This data will be used to increase fundamental understanding of the whirl flutter instability, which currently limits the high speed performance of tiltrotor rotorcraft. This effort mitigates risk for the Joint Multi-Role Technology Demonstrator (JMR-TD) effort and informs FVL requirement definition and technology maturation. The experimentally validated models will also be used to investigate concepts to reduce the vibration and improve stability of future aircraft.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL5 / *Air Vehicle Structures and Dynamics Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will evaluate the accuracy of current computational tools for the tilt-rotor configuration. Will complete the fabrication, acceptance tests, and initial wind tunnel test of TRAST, which will be used to generate novel wind tunnel experimental data to validate and refine the analytical modeling tools. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding for this effort realigned to Aeromechanics and Aeroelasticity of Future Air Vehicle Platforms effort within this Project.			
Title: Probabilistic and Damage Tolerance Methodologies ***Description:*** Advancement of probabilistic analytical algorithms and methods to enable air platform performance and availability. Probabilistic analytical methodologies resulting from this effort are expected to impact a broad range of air structure vehicle and dynamic technologies including enhanced damage tolerance. ***FY 2020 Plans:*** Will advance probabilistic analytics through exploitation of artificial intelligence and machine learning algorithms. Methods matured through this work will provide fundamental understanding for enhanced durability for next generation vertical lift manned and unmanned aircraft. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding for this effort realigned to Aeromechanics and Aeroelasticity of Future Air Vehicle Platforms effort within this Project.	-	0.937	-
Title: Aeromechanics and Aeroelasticity of Future Air Vehicle Platforms ***Description:*** Establish improved experimentally validated modeling tools and methodologies that can be used to understand the physics of aeroelastic stability and design in next generation rotorcraft platform configurations for FVL platforms. This involves the development of an experimental capability, (TRAST), which will be used to generate novel experimental data. This data will be used to increase fundamental understanding of the whirl flutter instability, which currently limits the high speed performance of tiltrotor rotorcraft. This effort will inform FVL requirement definition and technology maturation. This effort also establishes low noise rotor concepts and investigates the intersection of artificial intelligence and classical mechanics to enable novel mechanics and new approaches in structural dynamics for FVL applications to enable higher Operating Tempo (OPTEMPO) operations. ***FY 2021 Plans:*** Will conduct wind tunnel experiments of idealized tiltrotor configurations to understand the effects of rotor, wing, control parameters, and dynamic and aerodynamic coupling on aircraft stability to enable faster, more efficient, and sustainable tiltrotor aircraft. Will increase understanding of aerodynamic and acoustic interactions through simulation and experiments; validate modeling capabilities for multi-rotor and compound vertical lift concepts to enable quieter operations. Will advance knowledge of	-	-	2.824

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL5 / *Air Vehicle Structures and Dynamics Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
underlying mechanics through exploration of materials for vibrational damping, actuation, and sensing through experiments and artificial intelligence/machine learning to enable the development of massively reconfigurable air vehicle configurations. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21, this effort is realigned from Air Vehicle Structures and Dynamics Technology, and Probabilistic and Damage Tolerance Methodologies efforts in this Project.			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.125	-
Accomplishments/Planned Programs Subtotals	-	2.766	2.824

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL8 / *Holistic Situational Awareness and Dec Making 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
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	0.000	1.745	1.783	-	1.783	1.819	1.855	1.877	1.896	0.000	10.975

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602120A Sensors and Electronic Survivability
* Project H16 S3I Technology
PE 0602705A Electronics and Electronic Devices
* Project H94 Elec & Electronic Dev

A. Mission Description and Budget Item Justification

This Project focuses on modeling and simulation of pilotage and decision aiding system technology that allows for care free operations in complex and hostile environments.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 effort is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Radar Sensing and Phenomenology	-	1.665	-
Description: This effort develops the technical underpinnings of radar and other active and passive radio frequency (RF) sensing modalities for several key Army requirements. Focus in on cost effective radar concepts to enhance the situational awareness and navigation capabilities of US Army rotorcraft, allowing safe operation in Degraded Visual Environment (DVE). This research uses a combination of advanced computational electromagnetic models and algorithms, radar measurements, active and passive RF sensing technologies, and advanced signal processing.			
FY 2020 Plans: Will investigate novel forward looking synthetic aperture radar (FLSAR) concept for DVE using high fidelity electromagnetic radar signature models and verify with proof-of-concept laboratory measurements. Will explore techniques and algorithms to extend			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL8 / *Holistic Situational Awareness and Dec Making Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
the capability of rotorcraft collision avoidance radars to a hostile fire detection mode of operation and will investigate alternative architectures and modes of operation for FLSAR for imaging landing zones and targeting in DVE. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21 effort realigned within Project scope to Wideband RF Sensors and Situational Awareness Radar for DVE mitigation efforts within this Project.			
Title: Wideband RF Sensors ***Description:*** This effort develops the technical underpinnings of radar and other active and passive RF sensing modalities for several key Army requirements, with a focus on cost effective radar concepts to enhance the situational awareness and navigation capabilities of US Army rotorcraft to operate safely in DVE. This research uses a combination of advanced computational electromagnetic models and algorithms, radar measurements, active and passive RF sensing technologies, and advanced signal processing. ***FY 2021 Plans:*** Will investigate and explore FLSAR design options and develop instrumentation to collect outdoor data. Will implement fast 3-D SAR imaging algorithm for signal processor that leverages the architecture and capability of advanced Graphics Processor Units (GPUs). ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21 this effort realigned from Radar Sensing and Phenomenology effort within this Project.	-	-	0.892
Title: Situational Awareness Radar for DVE mitigation ***Description:*** This effort investigates technologies and algorithms for compact radars that will provide a hazard warning capability to airborne platforms in all environmental conditions, including those with zero visibility. This hazard warning capability will detect collision threats and specific projectile hazards around the entire aircraft using a suite of small form-factor radars. Algorithms are created to interpret the data produced by these radars and distinguish threats from benign clutter. Innovative radar architectures and device technologies are investigated and demonstrated to enhance and extend performance. ***FY 2021 Plans:*** Will investigate waveforms to minimize interference between the radars on different platforms and reduce their susceptibility to detection and electronic attack. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** In FY21 this effort realigned from Radar Sensing and Phenomenology effort within this Project.	-	-	0.891
Title: FY 2020 SBIR/STTR Transfer	-	0.080	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL8 / *Holistic Situational Awareness and Dec Making Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	1.745	1.783

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AM2 / *Aircraft and Aircrew Protection 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
AM2: *Aircraft and Aircrew Protection Technology*	-	0.000	1.522	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.522

Note

In Fiscal Year 2020 (FY20) this Project was realigned from:
Program Element (PE) 0602211A Aviation Technology
* Project 47A Aeron & ACFT Wpns Tech

In FY21 this Project is realigned to:
PE 0602148A Future Verticle Lift Technology
* Project AJ4 Digital Vehicle Management and Control Technology

A. Mission Description and Budget Item Justification

This Project investigates and develops leap-ahead structures technologies, concepts, and capabilities that enable break-through improvements in weight efficiency, performance, and extreme-environment operational durability, as well as enhanced platform design, qualification, and fleet structural integrity management for application to Future Vertical Lift (FVL) platforms. Technologies also have applicability to Future Unmanned Aircraft Systems (FUAS).

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Aircraft & Aircrew Protection	-	1.453	-
Description: Enables survivable, sustainable rotorcraft configurations by conceiving of and evaluating critical aviation technologies using design and analysis methods with greater modeling fidelity with an ultimate goal of reducing the timelines associated with overall design of FVL and FUAS platforms. Introduces high fidelity methodology for improved performance and design predictions earlier in the development and acquisition process. Use physics of failure modeling and coupled discipline analysis to drastically improve component and system reliability.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AM2 / *Aircraft and Aircrew Protection Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Will develop more accurate analytical prediction of rotorcraft internal structural loads resulting from external air loads, and light-weight biology-inspired structural concepts enabling on-the-fly configuration adaptation for near-optimal performance and protection across various flight conditions. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This Project is realigned in FY21 to PE 602148A (Future Vertical Lift Technology) / AJ4 (Digital Vehicle Management and Control Technology).			
Title: FY 2020 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.069	-
Accomplishments/Planned Programs Subtotals	-	1.522	-

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AM4 / *Opt Energy Stg & Therm Mgmt for FVL Survivability*	

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
AM4: *Opt Energy Stg & Therm Mgmt for FVL Survivability*	-	0.000	4.912	8.674	-	8.674	7.356	7.533	7.634	7.635	0.000	43.744

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602705A Electronics and Electronic Devices
* Project H11 Tactical and Component Power Technology.

A. Mission Description and Budget Item Justification

This Project investigates emerging power generation, energy storage, and thermal management technologies needed for future Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) and survivability equipment that could be incorporated onto Future Vertical Lift (FVL) and other Army platforms. Provides power capability for advanced electric aeromechanical effectors, advanced mission systems algorithms for route planning and teaming and advanced electronic warfare devices.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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 performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Optimized Energy for C5ISR Platforms	-	4.912	4.948
Description: This effort investigates power and thermal management associated with high power C5ISR capabilities on ground and air platforms enabling enhanced mobility and mission flexibility. This effort funds research to improve FVL aircraft and other Army platforms power efficiency through the use of on-demand hybrid power architectures, while also researching ways to eliminate platform thermal constraints. This effort will also investigate very high density power sources and energy storage for high rate pulsed power, power management, and thermal management for dynamic high rate pulsed power.			
FY 2020 Plans: Will investigate power requirements for emerging C5ISR capabilities to include directed energy, lasers, high power sensors, and electromagnetic weapons. Will develop models based on size, weight, and power requirements and aircraft platform constraints which include architectures and intelligent control variants to manage these loads. Will analyze the high resolution characterization			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AM4 / *Opt Energy Stg & Therm Mgmt for FVL Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
of cyclical, step and high power load profiles likely to result from use of lasers or other high power, short duration burst technology to inform the modularization of the storage technology needed to support the loads. Will examine thermal implications of waste heat generated from inefficiencies in power conversation and its impact on the aircraft. Will conduct experiments on hybrid energy storage technologies to support cyclical loads such as hybrid batteries or ultra-capacitor technology. Will define models for the use of intelligent control strategies for platform integrated power systems. ***FY 2021 Plans:*** Will investigate power requirements for emerging C5ISR. Will explore use of models based on size, weight, and power requirements and aircraft platform constraints, which include architectures and intelligent control variants for management of these loads. Will conduct experiments on the modularization of the storage technology needed to support high power, short duration burst loads. Will investigate thermal implications of waste heat generated from inefficiencies in power conversion and its impact on the aircraft. Will conduct experiments on hybrid energy storage technologies to support cyclical loads such as hybrid batteries or ultra-capacitor technology. Will validate models of intelligent controls for platform-integrated power systems to conduct experiments on control strategies. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Power & Thermal Management Components ***Description:*** This effort develops power and thermal management component technologies to meet the power and thermal demands of Future Vertical Lift aircraft while minimizing system size and weight. Technology will be validated through component level test. ***FY 2021 Plans:*** Will develop and perform component level validation testing on advanced power generation technologies such as lightweight, efficient turbo-generators and advanced thermal management technologies specifically designed for application to FVL aircraft. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** This effort has been realigned in FY21 from PE 0602148A (Future Vertical Lift Technology) / AI7 (Alternative Concept Engine Technology).	-	-	3.726
Accomplishments/Planned Programs Subtotals	-	4.912	8.674

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 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AM4 / *Opt Energy Stg & Therm Mgmt for FVL Survivability*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) BP7 / *Future Vertical Lift Air Platform Tech (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
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	0.000	14.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.000

Note

Congressional Interest Item funding provided for Future Vertical Lift Air Platform Technology.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Future Vertical Lift Platform Technology.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Flight Control Technology Safety and Survivability	-	3.000
FY 2020 Plans: Flight Control Technology Safety and Survivability		
Congressional Add: Rotary Wing Adaptive Flight Control Technology	-	6.000
FY 2020 Plans: Rotary Wing Adaptive Flight Control Technology		
Congressional Add: Technology Transfer and Innovation	-	5.000
FY 2020 Plans: Technology Transfer and Innovation		
Congressional Adds Subtotals	-	14.000

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) BZ7 / *Future Vertical Lift Medical Technologies*	

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
BZ7: *Future Vertical Lift Medical Technologies*	-	0.000	0.000	8.211	-	8.211	8.195	8.292	8.492	8.493	0.000	41.683

Note

In Fiscal Year 2021 (FY21) this Project was realigned from:
Program Element (PE) 0602787A Medical Technology
* MK4 Warfigher Health Applied Rsch Technology

A. Mission Description and Budget Item Justification

This Project involves research to prevent injury and performance degradation in Aviators, Unmanned Arial System (UAS) Operators and other Warfighters in training and operations; refines risk assessment and performance models based on operational stressors, e.g., sleep deprivation, work load, fatigue; and delivers biomedical-based spinal injury criteria and assessment methodologies. This research provides medical information important to the design and operational use of future vertical lift aircraft, and when appropriate, ground vehicles.

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

Work in this Project is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Medical Standards to Support Future Vertical Lift	-	-	8.211
Description: This effort entails development of medical input for equipment and personnel standards for Future Vertical Lift (FVL) aircraft and personnel. Efforts will address visual display guidelines, risk and performance standards for FVL operators and injury criteria and assessment methods for seated occupants.			
FY 2021 Plans: Will develop advanced visual display guidelines to assist aviators in maintaining situational awareness during extreme degraded visual environment (DVE) conditions. Will develop aviator composite risk assessment and performance model based on DVE and other operational stressors. Will deliver to the Aviation and Missile Center (AvMC) for FVL, and when appropriate, to the Ground Vehicle Systems Center (GVSC) for the Next Generation Combat Vehicle (NGCV), provisional biomedical-based spinal injury criteria and assessment methodologies for two types of vertebral body fractures that seated occupants experience during vertical exposures.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** BZ7 / *Future Vertical Lift Medical Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
This Project is realigned in FY21 from PE 0602787A (Medical Technology) / MK4 (Warfigher Health Applied Rsch Technology).			
Accomplishments/Planned Programs Subtotals	-	-	8.211

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 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CC3 / *FVL Radar Technologies*	

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
CC3: *FVL Radar Technologies*	-	0.000	0.000	0.724	-	0.724	0.450	0.000	0.000	0.000	0.000	1.174

Note

In Fiscal Year 2021 (FY21) this Project was realigned from:
Program Element (PE) 0602270A / Electronic Warfare Technology
*906 Tactical Electronic Warfare Applied Research.

A. Mission Description and Budget Item Justification

This Project develops underlying technologies applicable to next generation radar apertures used for detection, tracking and precision targeting, navigation and fire control for multiple modalities.

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development).

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

Work in this Project is performed by the Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Battlefield Surveillance & Targeting Radar Technology	-	-	0.724
Description: Advanced Reconnaissance, Surveillance and Target Acquisition Waveform Designs for advanced multi-beam Ground Moving Target Indicator (GMTI) and Synthetic Aperture Radar (SAR) systems. ***FY 2021 Plans:*** Will investigate modeling and simulation of subsystem and component level designs for advanced GMTI and SAR systems. Will investigate standards and interface requirements necessary to facilitate integration of scalable Radio Frequency (RF) components at the sub aperture level; conduct experiments to determine optimal techniques for waveform optimization to mitigate spectrum challenges. Will investigate multi-function RF modes and waveforms external to traditional SAR and GMTI radar collection. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Funding increase due to realignment from PE 0602270A / Electronic Warfare Technology (multiple projects)			
Accomplishments/Planned Programs Subtotals	-	-	0.724

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CC3 / *FVL Radar Technologies*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A