Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	220.334	261.880	177.836	-	177.836	170.020	185.821	190.893	184.028	0.000	1,390.812
AI8: *Alternative Concept Engine Advanced Technology*	-	2.507	3.828	2.038	-	2.038	2.174	2.211	2.211	2.211	0.000	17.180
AJ1: *Future UAS Engine Advanced Technology*	-	2.355	-	-	-	-	-	-	-	-	0.000	2.355
AJ3: *Next Generation Rotorcraft Transmission Adv Tech*	-	1.342	1.404	-	-	-	-	-	-	1.447	0.000	4.193
AJ5: *Digital Vehicle Management & Control Advanced Tech*	-	6.340	-	-	-	-	-	-	-	-	0.000	6.340
AJ7: *Advanced Rotors Advanced Technology*	-	2.407	2.477	-	-	-	-	-	-	-	0.000	4.884
AJ9: *Integ Mission Equip for Vert Lift Systems Adv Tech*	-	21.369	23.915	25.066	-	25.066	17.020	3.372	-	-	0.000	90.742
AK3: *Aviation Survivability Advanced Technology*	-	12.606	3.966	4.118	-	4.118	-	-	-	-	0.000	20.690
AK5: *Multi-Role Small Guided Missile Advanced Tech*	-	2.519	5.867	11.209	-	11.209	11.743	7.053	-	-	0.000	38.391
AK7: *Adv Rotorcraft Armaments Protection Sys Adv Tech*	-	6.177	10.541	9.580	-	9.580	3.078	-	-	-	0.000	29.376
AK8: *Air Launched Effects Advanced Technology*	-	28.542	28.905	28.798	-	28.798	27.895	27.869	27.878	27.871	0.000	197.758
AL1: *Adv Teaming for Tactical Aviation Oper Adv Tech*	-	40.157	39.953	35.579	-	35.579	42.494	47.869	60.177	49.220	0.000	315.449
AL3: *HPC for Rotorcraft Applications Adv Tech*	-	4.862	5.073	-	-	-	-	-	-	-	0.000	9.935
AL7: *Full Spectrum Targeting Advanced Technology*	-	9.610	9.381	8.619	-	8.619	8.804	9.484	10.213	10.194	0.000	66.305

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603465A *I Future Vertical Lift Advanced Technology*							
AL9: *Holistic Sit Awareness and Dec Making Adv Tech*	-	4.696	19.392	29.300	-	29.300	22.035	22.759	23.807	22.761	0.000	144.750
AM5: *Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech*	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
BP8: *Future Vertical Lift Air Platform Adv Tech (CA)*	-	68.750	82.500	-	-	-	-	-	-	-	0.000	151.250
CA8: *Adv Rotocraft Armaments Protection Sys*	-	0.963	1.234	2.862	-	2.862	9.551	12.617	12.621	12.618	0.000	52.466
CC4: *FVL Radar Advanced Technologies*	-	3.207	4.000	3.342	-	3.342	4.384	-	2.369	2.369	0.000	19.671
CG1: *Holistic Team Survivability Adv Tech*	-	-	6.424	11.898	-	11.898	15.272	17.290	21.124	24.753	0.000	96.761
CH6: *Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech*	-	-	4.561	-	-	-	-	-	-	-	0.000	4.561
CH7: *Power & Thermal Management for FVL Adv Tech*	-	-	3.402	4.396	-	4.396	4.275	5.418	7.513	5.392	0.000	30.396
CH8: *UAS Survivability Adv Technology*	-	-	5.057	-	-	-	-	-	-	-	0.000	5.057
CI8: *Adaptive Avionics Advanced Technologies**	-	-	-	-	-	-	-	10.716	18.772	18.767	0.000	48.255
CJ5: *Future Vertical Lift Medical Advanced Technology*	-	-	-	1.031	-	1.031	1.295	1.553	1.554	1.554	0.000	6.987
CK2: *High Speed Maneuverable Missile (HSMM) Adv Tech**	-	-	-	-	-	-	-	17.610	2.654	4.871	0.000	25.135

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2023

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates manned and unmanned air vehicle and mission system technologies as well as advanced teaming capabilities to enable Army Future Vertical Lift. Emphasis is on 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. Within this PE, aviation technologies are advanced and integrated into realistic and robust demonstrations.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603465A *I Future Vertical Lift Advanced Technology*

Research in this PE contributes to the Army Science and Technology (S&T) air systems portfolio and is fully coordinated with efforts in PE 0602148A (Future Vertical Lift Technology), PE 0602183A (Air Platform Applied Research) and PE 0603043A (Air Platform Advanced Technology).

A portion of this PE is directly aligned to the Future Vertical Lift (FVL) Army Modernization Priority.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas and the Army Modernization Strategy.

Research in this PE is performed by the United States Army Futures Command (AFC) and the Army Engineering Research and Development Center (ERDC).

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	220.334	179.677	0.000	-	0.000
Current President's Budget	220.334	261.880	177.836	-	177.836
Total Adjustments	0.000	82.203	177.836	-	177.836
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	82.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	177.836	-	177.836
• FFRDC Transfer	-	-0.297	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: BP8: *Future Vertical Lift Air Platform Adv Tech (CA)*		
Congressional Add: *Joint Tactical Aerial Resupply Vehicle*	8.000	8.000
Congressional Add: *Advanced Helicopter Seating System*	15.000	-
Congressional Add: *Helicopter Emergency Oil Systems*	2.000	-
Congressional Add: *UAV Fuel Systems Enhancements*	2.000	-
Congressional Add: *Surface Tolerant Advanced Adhesives*	5.000	4.000
Congressional Add: *Ferrium Steels for Improved Drive Systems*	5.000	-
Congressional Add: *Program Increase - UH-60 main rotor blade modernization*	5.000	5.000
Congressional Add: *Program Increase - Soldier Information Interface for Aviation Fleet Management Tool*	2.250	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603465A *I Future Vertical Lift Advanced Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add: *Program Increase - Displays and Safety in DVE*	4.000	-
Congressional Add: *Program Increase - Digital Engineering Demonstration*	8.000	-
Congressional Add: *Program Increase - Tethered UAS for All?Terrain Vehicles*	12.500	-
Congressional Add: *20MM Chaingun Development for FLRAA*	-	8.000
Congressional Add: *Air Launched Turbojet Missile*	-	15.000
Congressional Add: *Composite Structures*	-	5.000
Congressional Add: *Data Refinement and Optimization for Aviation Sustainment*	-	4.500
Congressional Add: *Degraded Visual Environment*	-	3.500
Congressional Add: *Digital Backbone*	-	5.000
Congressional Add: *Elastomeric Imaging*	-	3.000
Congressional Add: *Fleetspace Maintenance Tool*	-	4.500
Congressional Add: *Platform Digitization and Maintenance*	-	5.000
Congressional Add: *Stretch Broken Carbon Fiber*	-	10.000
Congressional Add: *UAS Fuel Systems Enhancements*	-	2.000
Congressional Add Subtotals for Project: BP8	68.750	82.500
Congressional Add Totals for all Projects	68.750	82.500

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AI8 / *Alternative Concept Engine Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AI8: *Alternative Concept Engine Advanced Technology*	-	2.507	3.828	2.038	-	2.038	2.174	2.211	2.211	2.211	0.000	17.180
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides demonstration of adaptable, fuel efficient, and high power to weight engine technologies for potential application to Future Vertical Lift platforms. Research includes development of alternative, adaptive and smart engine technologies to provide improved performance, readiness and affordability across the engine operating envelope for increased operational capability.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Alternative Concept Engine (ACE)	2.507	1.658	-
Description: This effort demonstrates alternative, adaptive, and intelligent engine technologies to provide improved / mission-optimized performance, readiness and affordability across an expanding engine envelope for increased operational capability for Future Vertical Lift (FVL) platforms. The alternative concept engine technology demonstrations planned for this effort are applicable to current and future platforms. ***FY 2022 Plans:*** Will complete engine sand ingestion and performance demonstration testing. Engine test metrics will include variable output speed, power turbine efficiency, high power to weight ratio, and durability. Engine technologies will be demonstrated to Technology Readiness Level (TRL) 6 for Future Vertical Lift applications. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** This effort ends in FY22.			
Title: Improved Propulsion Technology Demonstration (IPTD)	-	2.031	2.038

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AI8 / *Alternative Concept Engine Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: Effort will develop and execute an advanced engine integration, maintenance, and capability improvement strategy to produce key technology advancements on Future Long Range Assault Aircraft (FLRAA) engine systems, including the ACE engine technologies as appropriate. Full engine validation testing will be completed to TRL 6 providing improved propulsion system performance, maintainability, and durability while reducing integration risk for FVL FLRAA Platform. ***FY 2022 Plans:*** Will perform trade-off analysis and design of advanced engine technologies in engine integration, maintainability, and technology to produce improved engine performance, maintainability, and durability to meet FLRAA capability needs. ***FY 2023 Plans:*** Will perform engine technology trade-off analyses to optimize improvements in engine performance, weight, maintainability, and durability to meet FLRAA capability needs. Will perform advanced engine integration analyses to reduce engine integration risk onto FLRAA and enduring platforms. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort with reduced analysis of engine technologies and a move towards integration analysis.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.139	-
Accomplishments/Planned Programs Subtotals	2.507	3.828	2.038

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AJ1 / *Future UAS Engine Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ1: *Future UAS Engine Advanced Technology*	-	2.355	-	-	-	-	-	-	-	-	0.000	2.355
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides full system demonstration of a JP8-fueled, reliable, fuel-efficient and high power-to-weight engine concept for Future Unmanned Aircraft Systems (FUAS).

Work in this Project is fully coordinated with PE 0602148A (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 2021	FY 2022	FY 2023
Title: Reliable Advanced Small Power Systems	2.355	-	-
Description: This effort demonstrates adaptive and intelligent engine technologies to provide improved / mission- optimized performance, readiness, and affordability across an expanding engine envelope for increased operational capability for group 3 and 4 FUAS platforms.			
Accomplishments/Planned Programs Subtotals	2.355	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AJ3 / *Next Generation Rotorcraft Transmission Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ3: *Next Generation Rotorcraft Transmission Adv Tech*	-	1.342	1.404	-	-	-	-	-	-	1.447	0.000	4.193
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to:
Program Element (PE) 0603043A (Air Platform Advanced Research)
Project CX2 (Next Generation Aviation Transmission Adv Tech)

A. Mission Description and Budget Item Justification

This Project develops and ground demonstrates variable-speed transmission technologies that can be matured and integrated into the development of Future Vertical Lift (FVL) platforms.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Next Generation Rotorcraft Transmission ***Description:*** This effort demonstrates advanced rotorcraft drive technologies with the potential to increase the horsepower-to-weight ratio; reduce drive system noise; reduce production, operating and support costs; and provide automatic component impending-failure detection. The drive system demonstrators for this effort will be applicable to Future Vertical Lift (FVL) platforms.	1.342	-	-
Title: High Reduction-Ratio Transmission. ***Description:*** This effort will mature and demonstrate the technologies necessary for development, design, fabrication, and testing of a high reduction-ratio transmission in two stages or less (60:1 reduction ratio) with high efficiency and improved reliability against corrosion and seal leakage. Technology demonstrations from this effort will be applicable to FVL platforms. ***FY 2022 Plans:***	-	1.353	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AJ3 / *Next Generation Rotorcraft Transmission Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Begin design of a transmission that demonstrates 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. Design will include advanced gear materials and advanced seals for high reliability and reduced life-cycle costs. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE 0603043A (Air Platform Advanced Research) / Project CX2 (Next Generation Aviation Transmission Adv Tech).			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.051	-
Accomplishments/Planned Programs Subtotals	1.342	1.404	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AJ5 / *Digital Vehicle Management & Control Advanced Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ5: *Digital Vehicle Management & Control Advanced Tech*	-	6.340	-	-	-	-	-	-	-	-	0.000	6.340
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project designs, integrates, and demonstrates Future Vertical Lift (FVL) flight control and Vehicle Management Systems (VMS) technologies. Technologies demonstrated include: advanced flight control laws and autonomy; automatic reconfiguration for speed/damage; coupled cockpit symbology and haptic cueing; and handling qualities requirements for new platform concepts. Develops and demonstrates structures technologies and mission-adaptive autonomy and control algorithms that provide level 1 handling qualities, resilience to extreme and hostile environments, damage-mitigation by reconfiguration of redundant controls, increased agility and speed with minimal fatigue, increased payload and weight efficiency, optional pilotage and manned-unmanned teaming capabilities, cognitive off-loading, and reduction of structural maintenance burden.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Adaptive and Resilient Tactical Autonomy, Controls, and Structures (ARTACS) Adv Tech	6.340	-	-
Description: Develop, integrate, and demonstrate autonomy, controls, and advanced structures technologies to ensure mission success for manned/unmanned, multiple capability set FVL platforms in the contested environment of multi-domain operations.			
Accomplishments/Planned Programs Subtotals	6.340	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AJ5 / *Digital Vehicle Management & Control Advanced Tech*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AJ7 / *Advanced Rotors Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ7: *Advanced Rotors Advanced Technology*	-	2.407	2.477	-	-	-	-	-	-	-	0.000	4.884
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project CX1/ Advanced Rotors Advanced Tech.

A. Mission Description and Budget Item Justification

This Project demonstrates and integrates new technologies that enable global and highly efficient/reliable operations for Future Vertical Lift (FVL) aircraft and Future Unmanned Aircraft Systems (FUAS) throughout the flight envelope.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Rotors Technology	2.407	-	-
Description: This effort demonstrates full scale, integrated rotor system technologies through the assessment of alternative designs aimed to satisfy future capability needs for FVL and FUAS increased system durability, efficiency, speed, range, and payload. Technologies include: integrated high speed, low drag rotor technologies for high speed configurations; interactional aero tailoring between rotor and body & auxiliary lift/ propulsors; light weight, low volume, efficient and high authority electro-mechanical actuators (EMAs); reliable and safety critical actuators/hubs/controls for Independent Blade Control (IBC)/swash plateless rotors; damage compensation/load alleviation; active/passive flow control; and automated track and balance.			
Title: High Speed, Highly Efficient Rotors	-	2.387	-
Description: This effort demonstrates full scale, integrated rotor system technologies through the assessment of alternative designs aimed to satisfy future capability needs for FVL increased system durability, efficiency, speed, range, and payload. Technologies include: integrated high speed, low drag rotor technologies for high speed configurations; interactional			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AJ7 / *Advanced Rotors Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
aerodynamics tailoring between rotor and body & auxiliary lift/ propulsors; light weight, low volume, efficient and high authority EMAs; reliable and robust actuators/hubs/controls for IBC/swashplateless rotors; active/passive flow control; and automated track and balance. ***FY 2022 Plans:*** Will complete detailed design of high speed, highly efficient rotor system for FVL platforms. Will commence fabrication of demonstration hardware. Will commence structural test planning. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CX1 Advanced Rotors Advanced Tech			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.090	-
Accomplishments/Planned Programs Subtotals	2.407	2.477	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AJ9 / *Integ Mission Equip for Vert Lift Systems Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AJ9: *Integ Mission Equip for Vert Lift Systems Adv Tech*	-	21.369	23.915	25.066	-	25.066	17.020	3.372	-	-	0.000	90.742
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a mission systems architecture to support Future Vertical Lift (FVL) through utilization of a reconfigurable and flexible tiered architectural approach.

This Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Integrated Mission Equipment for Vertical Lift Systems	21.369	23.037	25.066
Description: Develops and demonstrates a mission systems architecture to support FVL through utilization of a reconfigurable and flexible tiered architectural approach. The approach will consist of the following: Maturing and implementing Model Based Engineering methods and Modular Open Systems Architecture strategies; instantiating an architecture verification environment and developing an agile and resilient digital backbone to support the rapidly changing threat environment including the digital battleground.			
FY 2022 Plans: Will complete purchasing, assembly, and checkout of the Architecture Verification Environment (AVE) facility to provide validation and verification of the Fiscal Year 2021 (FY21) National Defense Authorization Act (NDAA) Modular Open Systems Approach (MOSA) requirements. Will mature the verification process and conduct MOSA validation and verification on FVL, Enduring Fleet and science and technology (S&T) developed artifacts to identify and close gaps for FVL. Will develop MOSA engineering processes and training materials for wider adoption of MOSA. Will acquire candidate Digital Backbone technologies to evaluate in the AVE facility and update the Digital Backbone Objective Architecture. Will acquire core, reusable mission capabilities (e.g., route planning, digital map) to test Model Based System Engineering (MBSE), airworthiness and cyber qualification methods. Will expand the cloud-based Architecture Collaboration Environment (ACE) capabilities and maintain Authority to Operate (ATO)			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AJ9 / *Integ Mission Equip for Vert Lift Systems Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
to develop MBSE specifications for the Digital Backbone, core software infrastructure capabilities, and Mission Systems Flying Testbed (MSFTB) to be integrated on UH-60M Black Hawk . Will acquire core software infrastructure capabilities, that are airworthy, and cyber security certifiable, for the MSFTB and conduct laboratory integration assessments. Will acquire and install the Digital Backbone A-Kit in a UH-60M aircraft. Will design and acquire the MSFTB ground and flight test equipment and begin component assembly in the ground lab environment. Will perform a model-based source selection of multiple MSFTB Mission System Integrators for future down-selection based on FY21 NDAA MOSA requirements ***FY 2023 Plans:*** Will mature and improve automation of AVE capabilities to validate and verify FY21 National Defense Authorization Act MOSA requirements. Will demonstrate AVE capabilities to evaluate Future Vertical Lift and Enduring Fleet vendor designs for MOSA conformance. Will demonstrate incremental airworthiness and cyber security qualification for infrastructure capabilities enabling affordability and faster to field for innovative integration. Will demonstrate Digital Backbone A-Kit performance and ability to ease mission systems installation in an experimental UH-60M aircraft. Will demonstrate third party integration of mission system components in the MSFTB lab. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.878	-
Accomplishments/Planned Programs Subtotals	21.369	23.915	25.066

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AK3 / *Aviation Survivability Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK3: *Aviation Survivability Advanced Technology*	-	12.606	3.966	4.118	-	4.118	-	-	-	-	0.000	20.690
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates increased Future Vertical Lift (FVL) survivability through the integration and demonstration of technologies that reduce platform signatures, improve threat warning and countermeasures against integrated networked air and ground threat systems. Also matures and demonstrates unmanned aircraft systems (UAS) survivability technologies to enable manned/unmanned team based approaches to enable operation in contested peer/near peer environments.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Survivability Against Integrated Networked Threats	5.093	3.821	4.118
Description: This effort increases rotorcraft survivability by reducing platform signatures, providing the means to more efficiently counter enemy detection and tracking systems			
FY 2022 Plans: Will mature Survivability Correlator software and supporting components, such as the interfaces to available sensors and effectors, for demonstration. Will integrate relevant sensors and effectors, verify functionality, and demonstrate own-ship Aircraft Survivability Correlator capabilities. Will continue development of team-based survivability technologies.			
FY 2023 Plans: Will continue to mature own-ship Aircraft Survivability Correlator capabilities and technologies. Will begin integration and ground testing of Aircraft Survivability Correlator software onto a surrogate FVL aircraft. Will demonstrate Aircraft own- ship Survivability Correlator at an open air range with surrogate threat systems to avoid and counter.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AK3 / *Aviation Survivability Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding change reflects planned lifecycle of this effort.			
Title: Cognitive Countermeasures Maturation and Demonstration ***Description:*** This effort matures and demonstrates adaptive countermeasure technologies that provide platform protection against guided threats. It provides countermeasure electronics for adaptive decision making and countermeasure components that enable systems to counter the characteristics of agile threats.	2.000	-	-
Title: EW Air Sensors / Countermeasures ***Description:*** This effort matures and demonstrates sensor and countermeasure technologies that provide platform protection and integrated cueing against advanced and emerging threats to aviation platforms. It provides advanced sensors and effectors capable of detecting and responding to threats with diverse signatures.	4.483	-	-
Title: UAS Survivability Demonstration ***Description:*** UAS Survivability Technology (UST) addresses the evolving threat environment to support the Maneuver Force within the Multi-Domain Battle concept. UST will develop and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance. This work supports Future Vertical Lift and Advanced Unmanned Aircraft Systems.	1.030	-	-
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.145	-
Accomplishments/Planned Programs Subtotals	12.606	3.966	4.118

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AK5 / *Multi-Role Small Guided Missile Advanced Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK5: *Multi-Role Small Guided Missile Advanced Tech*	-	2.519	5.867	11.209	-	11.209	11.743	7.053	-	-	0.000	38.391
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a holistic lethality solution for current Army Aviation and Future Vertical Lift (FVL) Modernization Priority. This Project matures and demonstrates critical technology and designs components for future affordable rockets and missiles to provide overwhelming defeat of conventional and asymmetrical threats in all environments. Matures and demonstrates component technologies to enable an expeditionary short-to-medium range loitering maneuvering missile with man-in-the-loop capability for situational awareness, targeting, and lethal effects against hard and soft targets; and matures and demonstrates critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Single Multi-Mission Attack Missile ***Description:*** Matures and demonstrates component technologies for an expeditionary short-to- medium range loitering missile with man-in- the-loop capability for situational awareness, targeting, and lethal effects against hard and soft targets.	2.519	-	-
Title: Multiple Simultaneous Engagement Technologies (MSET) ***Description:*** Matures and demonstrates critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles against stationary and moving hard/soft targets, image-based target discrimination/shared situation awareness/lock-on, and multi-missile control digital datalink with inter-missile cooperative networked communications. The end-state is a multi-missile Organic command and control (C2) solution that handles all aspects of sensor integration, fire control, and airspace management. This capability will support overwhelming lethal effects against anti-access/aerial denial (A2AD) / Integrated Air Defense Systems (IADS).	-	5.653	11.209

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AK5 / *Multi-Role Small Guided Missile Advanced Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2022 Plans: Will mature and demonstrate component technologies through system level simulation integration and initial Hardware In the Loop (HWIL) component integration. Will continue to mature and improve component technologies utilizing simulation and HWIL results with the objective to suppress, defeat and/or destroy near peer A2AD/IADS threats at maximum survivable ranges. ***FY 2023 Plans:*** Will exercise flight hardware and software in the HWIL laboratory while simulating flight environments to demonstrate system performance and form predictions of outcome for simultaneous missile engagements, dynamic re-tasking of missiles in flight, target acquisition, terminal engagement, and operator workload. Will continue high-fidelity simulation analyses against MSET scenarios to verify subcomponent function and perform relevant trades to feed HWIL and flight test asset integration efforts. Will use simulation and HWIL results to continue developmental flight tests to demonstrate and validate system performance. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase advances critical technology maturation and evaluations required for future missile efforts concerning simultaneous multiple launches in support of the FVL Army Modernization Priority area.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.214	-
Accomplishments/Planned Programs Subtotals	2.519	5.867	11.209

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AK7 / *Adv Rotorcraft Armaments Protection Sys Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK7: *Adv Rotorcraft Armaments Protection Sys Adv Tech*	-	6.177	10.541	9.580	-	9.580	3.078	-	-	-	0.000	29.376
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project investigates and demonstrates a holistic lethality solution for Future Vertical Lift (FVL) offensive and defensive applications, focused on but not limited to Future Attack Reconnaissance Aircraft. Develop components for use in multi-role armament solutions for fire control, armament systems, munitions and integration of threat agnostic countermeasures.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Rotorcraft Armament and Protection System (ARAPS) - Future Attack Reconnaissance Aircraft (FARA)	5.744	9.572	6.762
Description: This effort matures and demonstrates a holistic medium caliber lethality solution for Future Vertical Lift offensive applications. Develops components for use in multi-role armament solutions for fire control, software, armament systems, and munitions.			
FY 2022 Plans: Will mature aviation specific fire control software and algorithms to support aviation requirements for turreted medium caliber weapon targeting solutions including Future Vertical Lift Future Attack Reconnaissance Aircraft?s. Will integrate and optimize a 20mm armament system onto a representative aviation platform.			
FY 2023 Plans: Will integrate medium caliber weapon with aviation specific fire control software. Will mature and demonstrate turreted medium caliber weapon platforms with targeting solution software for use in aviation systems including Future Vertical Lift Future Attack Reconnaissance Aircraft.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AK7 / *Adv Rotorcraft Armaments Protection Sys Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY23 decrease is due to identification of requirements for FARA that are suitable for the Army?s needs.			
Title: ARAPS-Dispenser ***Description:*** This effort matures and demonstrates a dispenser countermeasure, a component of the holistic survivability solution for Future Vertical Lift defensive applications. Develop components for use in multi-role countermeasure solutions for fire control, software and countermeasure systems. ***FY 2022 Plans:*** Will optimize design of countermeasure dispenser to further address survivability for current and future aviation platforms. Will demonstrate capabilities of an optimized counter measure dispenser. ***FY 2023 Plans:*** Will optimize tracking and dispensing capabilities for countermeasure dispenser to increase survivability of current and future aviation platforms. Will mature capability of fire control systems with use of countermeasure dispenser. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort in design optimization of dispenser.	0.433	0.585	2.818
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.384	-
Accomplishments/Planned Programs Subtotals	6.177	10.541	9.580

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AK8 / *Air Launched Effects Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AK8: *Air Launched Effects Advanced Technology*	-	28.542	28.905	28.798	-	28.798	27.895	27.869	27.878	27.871	0.000	197.758
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the ability to launch an Unmanned Aircraft System (UAS) from a manned or unmanned Future Vertical Lift (FVL) aircraft at tactical altitudes and to control the UAS from the cockpit or a crew station; and assesses the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Air Launched Effects	28.542	27.850	28.798
Description: Develop and demonstrate the ability to launch a future unmanned aircraft system (FUAS) from FVL platform at tactical altitudes, and to control the UAS from the cockpit or a crew station. Assess the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios. These air-launched FUAS will employ a variety of non-lethal effects including: electronic attack, decoy, and communications relay.			
FY 2022 Plans: Will integrate synthetic aperture radar payload, enhanced target acquisition software, and complimentary autonomous behaviors into air launched effects UAS, and evaluate increased capability to detect, identify, locate, and report threats through flight testing. Will integrate decoy payloads and associated individual UAS autonomous employment behaviors into air launched effects, and evaluate system performance through flight testing. Will integrate advanced communications payload into air launched effects UAS and evaluate effectiveness for Joint all-domain operations. Will mature and integrate a modular open systems approach (MOSA) based mission equipment package in accordance with approved hardware and software architectures to allow rapid technology insertion and payload integration on the future family of air launched effects air vehicles. Will mature and evaluate air launched UAS recovery system, enabling cost savings and improved mission capability through asset reuse. Will demonstrate			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AK8 / *Air Launched Effects Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
improvements in mission effectiveness enabled through these air launched effects enhancements as a part of a multi-domain combined arms team through participation in Joint service all-domain experiments. ***FY 2023 Plans:*** Will integrate electronic warfare (EW) payload and employment software into air launched effects air vehicle and evaluate ability to disrupt and jam threat systems using a single human supervising teams of air launched effects UAS through flight testing. Will integrate secure, anti-jam communications payload into air launched effects UAS and evaluate effectiveness for Joint all-domain operations. Will verify ability to rapidly insert software and payload technologies into the modular open systems approach (MOSA) based mission system architecture. Will demonstrate team of Detect, Identify, Locate, and Report (DILR), Decoy, Disrupt, and Lethal air launched effects UAS, equipped with advanced teaming software, executing collaborative reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, decoy, and EW to disrupt or jam as a part of a multi-domain combined arms team through participation in Joint all-domain flight experiments. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.055	-
Accomplishments/Planned Programs Subtotals	28.542	28.905	28.798

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AL1 / *Adv Teaming for Tactical Aviation Oper Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL1: *Adv Teaming for Tactical Aviation Oper Adv Tech*	-	40.157	39.953	35.579	-	35.579	42.494	47.869	60.177	49.220	0.000	315.449
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates and drafts frameworks for autonomous teaming behaviors and autonomous decision making for Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platform formations in combined arms operations.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Teaming Demonstration	32.378	30.885	27.224
Description: Develop and demonstrate teaming behaviors and autonomous decision making for mixed FVL and FUAS platform formations in combined arms operations that are beyond current Manned-Unmanned Teaming (MUM-T) technologies. Focus areas include: resilient autonomous algorithms; self-organizing unmanned formations; distributed command and control; and navigation. This effort will also demonstrate multi-platform distributed apertures of multispectral sensors for threat detection and awareness and improved reliability through adaptation in autonomous systems.			
FY 2022 Plans: Will mature and integrate advanced teaming technologies into mission systems teaming architecture for mixed formations of manned and unmanned aircraft, and demonstrate through flight testing multi-Unmanned Aircraft System (UAS) collaborative reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, and decoy in GPS denied and communications degraded conditions. Will simulate autonomous decoy and electronic attack synchronized UAS team behaviors in mission representative vignettes. Will verify modular open systems integration approaches for rapidly upgradable and transitionable team autonomy. Will integrate collaborative autonomous behaviors including team mission command, autonomous RSTA execution, electronic warfare mission planning to disrupt or jam, coordinated RF homing and sensing using multiple aircraft equipped with aided target recognition, decoy mission management to divulge threats, and team adaptions network disruptions, into teams of			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL1 / *Adv Teaming for Tactical Aviation Oper Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
UAS, including air launched effects, and demonstrate advanced teaming concepts of operations and improvements in mission effectiveness as a part of a multi-domain combined arms team through participation in Joint service all-domain experiments. ***FY 2023 Plans:*** Will mature and flight-demonstrate advanced teaming technologies integrated into mission systems architecture for real-time mission planning and synchronized execution of collaborative team reconnaissance, surveillance, target acquisition (RSTA), coordinated attack, decoy, and electronic warfare (EW) to disrupt or jam using mixed formations of manned and unmanned aircraft, including air launched effects, as a part of a multi-domain combined arms team through participation in Joint all-domain experiments. Will test and evaluate autonomous in-stride replanning software that dynamically adapts battlefield situational awareness updates, network connectivity, and team member capability. Will simulate autonomous team of teams operations facilitating integrated air defense system (IADS) breach capability in contested conditions using mission representative vignettes. Will further enhance and verify modular open systems integration approaches for rapidly upgradable and transitionable team autonomy. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects the conclusion of Subsystem Technology development efforts and concentration on mission systems integration demonstrations.			
Title: Sensors / Multi-Function Imagers for Future Aviation ***Description:*** Mature and demonstrate multi-function sensing system concepts to increase FVL manned platform survivability and situational awareness. This will enable the manned FVL platforms to engage in multi-domain advanced teaming operations and leverage autonomous behaviors of both manned and unmanned aviation platforms. This effort will enable tactical operations in complex environments (e.g. high threat, degraded visuals, and urban) through the use of sensing modules suitable for multiple tactical applications. The multifunction sensor approach will mitigate the need for separate dedicated threat warning and situational awareness imaging sensor modules, thus reducing the total cost and logistics burden for future aviation systems. ***FY 2022 Plans:*** Will mature digital readout dual band infrared sensor technologies for both pilotage and threat warning applications. Will mature digital readout integrated circuit based multispectral camera modules. Will demonstrate both laboratory and field test measurements to corroborate the higher sensitivity and fast frame rate performance of the novel multispectral cameras. Will integrate multispectral camera modules onto a manned airborne testbed platform. ***FY 2023 Plans:*** Will demonstrate digital readout integrated circuits integrated into multispectral camera modules for improved pilotage and threat warning capabilities. Will validate multispectral sensing and threat warning capabilities against various signatures and clutter. Will	7.779	7.610	8.355

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL1 / *Adv Teaming for Tactical Aviation Oper Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
optimize digital readout frame integration, adjustable frame rate and image processing settings for improved camera performance in varying environments and concepts of operations. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	1.458	-
Accomplishments/Planned Programs Subtotals	40.157	39.953	35.579

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AL3 / *HPC for Rotorcraft Applications Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL3: *HPC for Rotorcraft Applications Adv Tech*	-	4.862	5.073	-	-	-	-	-	-	-	0.000	9.935
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project DC3/ HPC for Army Aviation Concepts.

A. Mission Description and Budget Item Justification

This Project develops and demonstrates the use of high-fidelity computational fluid dynamics for Future Vertical Lift (FVL) platforms through the utilization of Department of Defense (DoD) High- Performance Computing (HPC) and software tools for cutting-edge modeling and simulation, as well as adding software capabilities for workflow automation and design space exploration. Efforts in this Project are also applicable to the family of Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platforms.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

Research is performed by the United States (US) Army Engineer Research and Development Center and coordinated with US Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Engineered Resilient Systems (ERS) for Army Aviation	4.862	2.987	-
Description: This effort supports Future Vertical Lift by exploiting advancements in physics-based software tools to provide rapid engineering analysis of proposed rotorcraft platforms, providing high-fidelity computational modeling of candidate Future Attack Reconnaissance Aircraft (FARA) platforms during the FARA down-selection, increasing the speed of simulations by automating simulation setup and execution on DoD HPC systems, and maturing and demonstrating the use of advanced machine learning techniques for aviation datasets to inform both the development of FVL systems and current operations.			
FY 2022 Plans: Improve the accuracy and continue to optimize the execution of low, medium, and high-fidelity computational modeling that supports ongoing analysis of the FARA and Future Long-Range Assault Aircraft (FLRAA) platforms. Improve the engineering			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL3 / *HPC for Rotorcraft Applications Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
analysis of the FARA and FLRAA systems through the inclusion of acoustic modeling and surrogate techniques. Advance surrogate modeling techniques to increase the speed of analysis for FVL platforms. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project Project DC3/ HPC for Army Aviation Concepts.			
Title: Engineered Resilient Systems (ERS) for Advanced Army Aviation Concepts ***Description:*** This effort supports Future Vertical Lift (FVL) by utilizing advanced machine-assisted design algorithms to explore design spaces and choose resilient platform variants. Advanced computational techniques will leverage automated design processes to expand computational testbeds in support of testing and evaluation. Increase high accuracy physics in modeling and simulation to optimize platforms for all operational environments and mission scenarios. Provide multi-fidelity computational models of candidate Future Attack Reconnaissance Aircraft (FARA), Future Long-Range Assault Platforms (FLRAA), and Future Tactical Unmanned Aircraft Systems (FTUAS) platforms to support acquisition decision-makers. ***FY 2022 Plans:*** Optimize the execution of low, medium, and high-fidelity computational modeling that supports analysis of FVL Family of Systems, Air-Launched Effects, and candidate FTUAS platforms. Provide tools for evaluating Air-Launched Effects and UAS platform's ability to support mission objectives and platform effectiveness through the expansion of computational testbeds. Demonstrate the use of advanced machine-assisted design techniques to increase the speed of analysis for FVL Family of Systems and UAS platforms. Evaluate the expansion of computational modeling capability to secret and above secret high-performance computing. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project Project DC3/ HPC for Army Aviation Concepts.	-	1.901	-
Title: FY 2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.185	-
Accomplishments/Planned Programs Subtotals	4.862	5.073	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL3 / *HPC for Rotorcraft Applications Adv Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AL7 / *Full Spectrum Targeting Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL7: *Full Spectrum Targeting Advanced Technology*	-	9.610	9.381	8.619	-	8.619	8.804	9.484	10.213	10.194	0.000	66.305
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project demonstrates next generation targeting concepts for Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS) platforms.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Full Spectrum Targeting	9.610	9.038	8.619
Description: This effort will mature and demonstrate key targeting sensor system concepts to enable the FVL and FUAS modernization priorities. Effort will leverage advancements in laser, infrared imaging focal plane arrays, compact long-range optics, and multispectral system technologies to develop a stabilized, payload that can actively and/or passively image in multiple spectral bands simultaneously to provide robust targeting and situational awareness capabilities for the prevailing battlefield conditions. Effort will demonstrate the ability of multispectral sensing to autonomously scan areas of interest and identify tactical threats with reduced cognitive workloads through sensor fusion and automated spectral selection.			
FY 2022 Plans: Will mature and integrate a novel dual-band infrared sensor along with advanced active / passive optical components and active / passive sensors into a steerable turret. Will mature approaches for spectral imaging for target detection using the steerable turret to conduct data collections with multiple spectral bands against military targets in relevant environments. Will mature approaches for detection of hidden, obscured, and decoy targets to improve sensor target recognition and identification performance. Will demonstrate automated processing techniques in multiple spectral bands suitable for detection, recognition and identification of FVL and FUAS relevant target sets. Will develop techniques for sensor fusion and automated selection of optimal spectral bands to reduce FVL and FUAS cognitive burden.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL7 / *Full Spectrum Targeting Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Will demonstrate improved threat detection range performance using a steerable turret with dual-band infrared sensor paired to novel, compact long-range optical components. Will validate approaches for multispectral imaging to detect military targets in relevant environments. Will optimize automated scanning and processing techniques in multiple spectral bands suitable for detection, recognition and identification (DRI) of FVL and FUAS relevant target sets. Will optimize sensor fusion techniques and automatic selection of optimal spectral bands to reduce FVL and FUAS operator burden. Will validate automated sensor scanning and DRI performance. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Decrease is primarily a result of reduced hardware research and development efforts and long-lead material purchase, with more emphasis shifting to optimization and demonstration of automated scanning, spectral modalities, and detection capabilities.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.343	-
Accomplishments/Planned Programs Subtotals	9.610	9.381	8.619

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AL9 / *Holistic Sit Awareness and Dec Making Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AL9: *Holistic Sit Awareness and Dec Making Adv Tech*	-	4.696	19.392	29.300	-	29.300	22.035	22.759	23.807	22.761	0.000	144.750
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a pilotage and decision aiding system that allows for care free operations in complex and hostile environments through: demonstration of a comprehensive human machine interface for all situational awareness (SA) domains (terrain & obstacles, threat, weather, & environment); and demonstration of decision aiding technologies to reduce cognitive loading of air crews during operations in complex and hostile environments.

Research in this Project is fully coordinated with Program Element (PE) PE 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Holistic Situational Awareness and Decision Making	4.696	9.210	12.835
Description: This program directly contributes to Future Vertical Lift (FVL) to ensure Future Aircraft pilots have the necessary situational awareness, accurate understanding of the tactical mission, and ability to decide faster than our adversaries.			
FY 2022 Plans: Will demonstrate FVL Air Mission Commander (AMC) increased effectiveness when equipped with the combined capabilities of a fused world model that includes both geo-referenced sensor output and abstract situational data, decision aiding tools, autonomous flight controls, and pilot cueing; Will participate in flight demonstration(s) to assess this capability?s impact on increasing mission effectiveness and reducing pilot cognitive workload			
FY 2023 Plans: Will demonstrate FVL cockpit crew increased effectiveness and decreased workload when equipped with a situational awareness world model, decision aiding tools, pilot-on-the-loop autonomy, and multi-sensory cueing. Workload and effectiveness will be measured using both subjective and objective means including biometrics. Will participate in Fiscal Year 2023 (FY23) Project Convergence through flight demonstration to assess this capability's impact in relevant mission scenarios.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL9 / *Holistic Sit Awareness and Dec Making Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding increase reflects increased contracted efforts in Decision Aiding technology development, simulation/evaluation events, and increased participation in demonstrations.			
Title: Multi-function RF for FVL Platforms ***Description:*** This effort matures and demonstrates multi-function radio-frequency (RF) sensor technologies to support the FVL family of systems. It provides integrated software and hardware technologies that enable the use of common electronics and system components to support varied functions, such as enhanced situational awareness, threat-detection and localization, targeting, communications, and aircraft pilotage. This will result in improved performance for these critical functions and reduced requirements for size, weight, and power for mission equipment across FVL platforms. ***FY 2022 Plans:*** Will analyze the technical requirements of multiple functions and perform engineering analysis to determine technical specifications; will develop technical models of multi-function RF components and assess expected performance against mission requirements; will initiate development of multi-function RF components. ***FY 2023 Plans:*** Will develop multi-function RF components from derived technical specifications. Will characterize the components in the laboratory and analyze their expected performance against the full set of mission requirements. Will develop software to enable resource management of multiple RF functional modes. Will complete design of the overall RF multi-function radio-frequency (RF) sensor system including hardware and software. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase reflects progression of the technology development from design and modeling to development and characterization of the hardware.	-	7.585	14.382
Title: Early Human Systems Integration Demonstrations ***Description:*** Human Systems Integration (HSI) analysis assesses and matures technologies to optimize pilot situational awareness and workload management, crew task automation and decision-aiding, information management, and advanced crew station interfaces. The objective of this effort is to reduce crew decision and task execution timelines in a tactically challenging mission environment. ***FY 2022 Plans:***	-	1.884	2.083

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** AL9 / *Holistic Sit Awareness and Dec Making Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Will perform HSI analysis during simulation and flight demonstration to assess and enhance technologies for advanced crew station interfaces, pilot decision-aids, and information management to reduce decision timelines. Will collect pilot performance data and provide knowledge products to assess and help mature crew-enabling technologies. ***FY 2023 Plans:*** Will demonstrate effects of crew task automation, decision-aiding, and augmented pilot displays on Soldier performance and system effectiveness by conducting human performance and human-system interface analyses via simulations, modeling, and evaluation of advanced technologies; will provide early (Advanced Technology Demonstration) assessment of HSI considerations for advanced crew station technology design, automation and decision-aiding, thereby reducing life-cycle costs; will optimize HSI designs of highest priority Army technologies and systems including advanced crew station technology design and automation for enhanced Soldier performance and system effectiveness. In addition, will demonstrate effects of decision aides, User Centered Design, more effective use of automation in command and control (C2), training and crew automation for accelerated expertise, design concepts to support rapid and enhanced sense-making, and a multilevel performance assessment in support of Air and Missile Defense. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.713	-
Accomplishments/Planned Programs Subtotals	4.696	19.392	29.300

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) AM5 / *Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AM5: *Opt Energy Stg & Therm Mgmt for FVL Surv Adv Tech*	-	1.925	-	-	-	-	-	-	-	-	0.000	1.925
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops and demonstrates at the system level, integrated power technologies (including power generation, distribution, and control along with advanced energy storage) and thermal management technologies to provide significantly higher electrical power capability to Future Vertical Lift (FVL) aircraft while addressing consequential size, weight, pulsed power, and thermal issues. Provides power capability for advanced electric aeromechanical effectors, advanced mission systems for route planning and teaming, and for advanced survivability and electronic warfare capability.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Optimized Energy for C5ISR Platforms Advanced Technology	1.925	-	-
Description: Enable advanced survivability systems on FVL platforms through component development improved high power and energy storage technologies, higher capacity lower Size, Weight, and Power (SWaP) cooling systems, and more efficient electrical architectures.			
Accomplishments/Planned Programs Subtotals	1.925	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) BP8 / *Future Vertical Lift Air Platform Adv Tech (CA)*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BP8: *Future Vertical Lift Air Platform Adv Tech (CA)*	-	68.750	82.500	-	-	-	-	-	-	-	0.000	151.250
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Future Vertical Lift Air Platform Advanced 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 2021	FY 2022
Congressional Add: Joint Tactical Aerial Resupply Vehicle	8.000	8.000
FY 2021 Accomplishments: Conducted advanced research in Joint Tactical Aerial Resupply Vehicle. Work executed by Army Futures Command.		
FY 2022 Plans: Congressional Interest Item funding provided for Joint Tactical Aerial Resupply Vehicle		
Congressional Add: Advanced Helicopter Seating System	15.000	-
FY 2021 Accomplishments: Conducted advanced research in Advanced Helicopter Seating System. Work executed by Army Futures Command.		
Congressional Add: Helicopter Emergency Oil Systems	2.000	-
FY 2021 Accomplishments: Conducted advanced research in Helicopter Emergency Oil Systems. Work executed by Army Futures Command.		
Congressional Add: UAV Fuel Systems Enhancements	2.000	-
FY 2021 Accomplishments: Conducted advanced research in UAV Fuel Systems Enhancements.		

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** BP8 / *Future Vertical Lift Air Platform Adv Tech (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Surface Tolerant Advanced Adhesives ***FY 2021 Accomplishments:*** Conducted advanced research in Surface Tolerant Advanced Adhesives. Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for FVL Surface Tolerant Adhesives	5.000	4.000
Congressional Add: Ferrium Steels for Improved Drive Systems ***FY 2021 Accomplishments:*** Conducted advanced research in Ferrium Steels for Improved Drive Systems. Work executed by Army Futures Command.	5.000	-
Congressional Add: Program Increase - UH-60 main rotor blade modernization ***FY 2021 Accomplishments:*** Conducted advanced research in UH-60 Main Rotor Blade Modernization. Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for UH-60 Main Rotor Blade Modernization	5.000	5.000
Congressional Add: Program Increase - Soldier Information Interface for Aviation Fleet Management Tool ***FY 2021 Accomplishments:*** Conducted advanced research in Soldier Information Interface for Aviation Fleet Management Tool. Work executed by Army Futures Command.	2.250	-
Congressional Add: Program Increase - Displays and Safety in DVE ***FY 2021 Accomplishments:*** Conducted advanced research in Displays and Safety in DVE. Work executed by Army Futures Command.	4.000	-
Congressional Add: Program Increase - Digital Engineering Demonstration ***FY 2021 Accomplishments:*** Conducted advanced research in Digital Engineering Demonstration.	8.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** BP8 / *Future Vertical Lift Air Platform Adv Tech (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command.		
Congressional Add: Program Increase - Tethered UAS for All?Terrain Vehicles ***FY 2021 Accomplishments:*** Conducted advanced research in Tethered UAS for All-Terrain Vehicles. Work executed by Army Futures Command.	12.500	-
Congressional Add: 20MM Chaingun Development for FLRAA ***FY 2022 Plans:*** Congressional Interest Item funding provided for 20MM Chaingun Development for FLRAA	-	8.000
Congressional Add: Air Launched Turbojet Missile ***FY 2022 Plans:*** Congressional Interest Item funding provided for Air Launched Turbojet Missile	-	15.000
Congressional Add: Composite Structures ***FY 2022 Plans:*** Congressional Interest Item funding provided for Composite Structures	-	5.000
Congressional Add: Data Refinement and Optimization for Aviation Sustainment ***FY 2022 Plans:*** Congressional Interest Item funding provided for Data Refinement and Optimization for Aviation Sustainment	-	4.500
Congressional Add: Degraded Visual Environment ***FY 2022 Plans:*** Congressional Interest Item funding provided for Degraded Visual Environment	-	3.500
Congressional Add: Digital Backbone ***FY 2022 Plans:*** Congressional Interest Item funding provided for Digital Backbone	-	5.000
Congressional Add: Elastomeric Imaging ***FY 2022 Plans:*** Congressional Interest Item funding provided for Elastomeric Imaging	-	3.000
Congressional Add: Fleetspace Maintenance Tool ***FY 2022 Plans:*** Congressional Interest Item funding provided for Fleetspace Maintenance Tool	-	4.500
Congressional Add: Platform Digitization and Maintenance ***FY 2022 Plans:*** Congressional Interest Item funding provided for Platform Digitization and Maintenance	-	5.000
Congressional Add: Stretch Broken Carbon Fiber	-	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** BP8 / *Future Vertical Lift Air Platform Adv Tech (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
FY 2022 Plans: Congressional Interest Item funding provided for Stretch Broken Carbon Fiber		
Congressional Add: UAS Fuel Systems Enhancements	-	2.000
FY 2022 Plans: Congressional Interest Item funding provided for UAS Fuel Systems Enhancements		
Congressional Adds Subtotals	68.750	82.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CA8 / *Adv Rotocraft Armaments Protection Sys*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CA8: *Adv Rotocraft Armaments Protection Sys*	-	0.963	1.234	2.862	-	2.862	9.551	12.617	12.621	12.618	0.000	52.466
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project investigates and demonstrates a holistic lethality solution for Future Vertical Lift (FVL) offensive and defensive applications, focused on but not limited to Future Long Range Assault Aircraft (FLRAA). Develop components for use in multi-role armament solutions for fire control, armament systems, munitions and integration of threat agnostic countermeasures.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Rotorcraft Armanents Protection System-Future Long Range Assault Aircraft	0.963	1.189	2.862
Description: This effort matures and demonstrates a holistic small caliber lethality solution for FVL offensive applications. Integrates and demonstrates components for use in multi-role armament solutions for fire control, software, and armament systems. ***FY 2022 Plans:*** Will mature designs for enhanced lethality with use of stabilization and holistic fire control in aviation platforms for gunner applications. Will mature architecture and interfaces in conformance with Future Airborne Capability Environment (FACE). ***FY 2023 Plans:*** Will mature use of holistic aviation fire control software, and demonstrate fire control architecture and interfaces in conformance with FACE. Will improve stabilized mount performance through sub-system level testing including modeling and simulation. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort in maturation of architecture and interfaces in conformance with FACE			
Title: FY2022 SBIR/STTR Transfer	-	0.045	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CA8 / *Adv Rotocraft Armaments Protection Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	0.963	1.234	2.862

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CC4 / *FVL Radar Advanced Technologies*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CC4: *FVL Radar Advanced Technologies*	-	3.207	4.000	3.342	-	3.342	4.384	-	2.369	2.369	0.000	19.671
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project develops Next Generation Reconfigurable Radar Aperture for detection, tracking and precision targeting, navigation and fire control for both reconnaissance, surveillance, and target acquisition (RSTA) and intelligence, surveillance and reconnaissance (ISR).

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Multi-mission Airborne Radar	3.207	3.854	3.342
Description: Advanced Digital radio frequency (RF) processing integration with final demonstration subsystem and system level radar hardware and software designs.			
FY 2022 Plans: Will leverage internal and joint partnerships to advance radar mode software development based upon the results of the system design review, market research and modeling and simulation efforts. Will develop advanced Airborne Moving Target Indicator mode, leveraging existing Air Force airborne search, scan, and track modes, to provide enhanced situational awareness and identification of airborne blue & red forces. Will develop Increment 1 Terrain Profiling radar mode.			
FY 2023 Plans: Will mature design component characteristics documented in both preliminary and critical design reviews. Component designs as well as system level capability verification will be completed via component modeling and simulation as well as bench top demonstration. Will demonstrate technology readiness level (TRL) 5 integrated components with a traditional tower test of radar modes.			
FY 2022 to FY 2023 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CC4 / *FVL Radar Advanced Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding realigned to support PE 0603465A (Future Vertical Lift Advanced Technology) / Project CK2 (High Speed Maneuverable Missile (HSMM) Adv Tech).			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.146	-
Accomplishments/Planned Programs Subtotals	3.207	4.000	3.342

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CG1 / *Holistic Team Survivability Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CG1: *Holistic Team Survivability Adv Tech*	-	-	6.424	11.898	-	11.898	15.272	17.290	21.124	24.753	0.000	96.761
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates increased Future Vertical Lift (FVL) Family of Systems Survivability (FoS) in an advanced integrated air defense systems environment through a multi-layered approach. The approach focuses on maturing and demonstrating technologies for reducing aircraft susceptibility and vulnerability during pre-mission planning, mission execution (combat survivability and safety), and post-mission repair and return to service.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Radio Frequency Countermeasures	-	6.189	6.789
Description: This effort matures and demonstrates adaptive sensor and countermeasure technologies that provide platform protection against guided threats. It develops software and hardware to increase probability of detection and defeat of threats to aviation platforms using modeling and simulation (M&S), hardware in the loop (HIL) assessment, and field events. It provides integrated software and sensor technologies to counter the characteristics of advanced and agile threats.			
FY 2022 Plans: Will develop technical designs of electronics to support detect, decoy, and disrupt functions for Future Vertical Lift Platforms; will perform technical analysis of threat characteristics, analyze threat progression, and research new attack vectors to disrupt or degrade threat performance; will update technical models of electronics to analyze performance and determine technical specifications; will perform laboratory and field demonstrations of targeted payloads in critical technology areas.			
FY 2023 Plans: Will demonstrate Radio Frequency (RF) payload via flight demonstration against multiple threat surrogates, concluding in a technology readiness level (TRL) assessment of RF payload. Will further optimize RF payload for integration and test in the			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CG1 / *Holistic Team Survivability Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
prototype Air Launched Effect (ALE) platform. Algorithms to optimize payload and platform behaviors will be tested in modeling and simulation environments with previously developed electronic warfare (EW) models for advanced teaming integration. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Holistic End to End Survivability ***FY 2023 Plans:*** Will continue to expand Survivability Against integrated and Networked Threats, Survivability Correlator capabilities. Will begin development of Crashworthiness/Crash predictive capabilities. Will continue to develop and mature team based survivability architectures, behaviors and component technologies. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding for this effort is realigned in FY23 from PE 0603465A (Future Vertical Lift Advanced Technology) / Project AK3 (Aviation Survivability Advanced Technology).	-	-	5.109
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.235	-
Accomplishments/Planned Programs Subtotals	-	6.424	11.898

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CH6 / *Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH6: *Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech*	-	-	4.561	-	-	-	-	-	-	-	0.000	4.561
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is administratively realigned to: Program Element (PE) 0603043A / Air Platform Advanced Research Project CV2/ Structures Platform Int: Resilience & Efficiency and Project CV1/ Control & Autonomy for Tactical Superiority Adv.

A. Mission Description and Budget Item Justification

This Project matures, and demonstrates advanced autonomy, controls, and structures technologies that provide manned/unmanned Future Vertical Lift (FVL) platforms the decisive tactical overmatch of near-peer adversaries needed for combat mission success. Matures and demonstrates modeling capabilities, control law development, and handling quality criteria required for fully realizing capabilities of advanced configurations of Army aircraft. Develops and demonstrates structures technologies and mission-adaptive autonomy (MAA) and control algorithms that provide level 1 handling qualities, resilience to extreme and hostile environments, damage-mitigation by reconfiguration of redundant controls, increased agility and speed with minimal fatigue, increased payload and weight efficiency, optional pilotage and manned-unmanned teaming capabilities, cognitive off-loading, and reduction of structural maintenance burden.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Adaptive and Resilient Engineered Structures (ARES) Technology Demonstration	-	3.322	-
Description: Mature, integrate, and demonstrate advanced structures technologies providing performance, survivability, and sustainment benefits with broad applicability across platform scale and role, enabling mission success for manned/unmanned FVL platforms in the contested environment of multi-domain operations.			
FY 2022 Plans: Will mature and integrate advanced structures technologies that enable multi-domain operations performance, efficiency, survivability, and sustainment, and enhance extreme environment reliability and availability. Will mature and integrate			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CH6 / *Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
leveraged trade studies optimizing the synergy of applicable technologies including weight-saving, fatigue-tolerant, affordable, multifunctional, and damage-tolerant configurations for primary and secondary structure. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CV2/ Structures Platform Int: Resilience & Efficiency.			
Title: Adaptive Tactical Autonomy and Control (ATAC) Technology Demonstration ***Description:*** Mature, integrate, and demonstrate advanced vehicle management, flight control, and autonomy technologies that enable FVL aircraft to achieve superior maneuverability and agility at all speeds, effectively exploit extreme/degraded environmental conditions as a force multiplier, fight and win in presence of failure or damage, and operate on a cognitive-loading-spectrum from piloted to fully autonomous. ***FY 2022 Plans:*** Will implement and demonstrate advanced flight control technologies and state-of-the-art autonomy algorithms on Army owned and operated flying laboratories to achieve Technology Readiness Level (TRL) 6. Will mature control strategies for seamless pilot interaction with scalable autonomy as needed for optionally piloted operations. Will demonstrate pilot interface technologies for enhanced situational awareness and optimal cognitive loading across the entire range of mission environments. Will mature high-speed extensions to handling qualities criteria for military rotorcraft including specialized response types and Mission Task Elements (MTE). ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is administratively realigned to PE: 0603043A / Air Platform Advanced Research, Project CV1/ Control & Autonomy for Tactical Superiority Adv.	-	1.072	-
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.167	-
Accomplishments/Planned Programs Subtotals	-	4.561	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CH6 / *Adapt & Resilnt Tact Autnmy Cont & Struct Adv Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CH7 / *Power & Thermal Management for FVL Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH7: *Power & Thermal Management for FVL Adv Tech*	-	-	3.402	4.396	-	4.396	4.275	5.418	7.513	5.392	0.000	30.396
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project matures and demonstrates at the system level, integrated electrical power technologies (including power generation, distribution, and control along with advanced energy storage) and thermal management technologies to provide significantly higher electrical power capability to Future Vertical Lift (FVL) aircraft while addressing consequential size, weight, pulsed power, and thermal issues. Provides power capability for advanced electric aeromechanical effectors, advanced mission systems that for example, execute algorithms for route planning and teaming, and for advanced survivability and electronic warfare capability. Will demonstrate software-in-the-loop performance of power & thermal management technologies to provide significantly higher electrical power capability to FVL aircraft while addressing consequential SWAP-C & thermal issues.

Research in this Project is fully coordinated with Program Element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Optimized Energy for C5ISR Platforms Advanced Technology	-	1.845	2.043
Description: Enable advanced Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) and survivability systems on FVL platforms through component development of improved high power and energy storage technologies, higher capacity lower Size, Weight, and Power (SWaP) cooling systems, and more efficient electrical architectures			
FY 2022 Plans: Will improve performance of energy storage technologies to meet the SWaP requirements of target air platforms. Will mature the high resolution characterization of C5ISR devices such as advanced radars and sensors to demonstrate the ability for energy storage technologies to meet the electrical power demands of the system. Will demonstrate the effectiveness of integrating power management strategies for electrical sources when powering C5ISR devices. Will demonstrate intelligent controls for platform-integrated power systems.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CH7 / *Power & Thermal Management for FVL Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Will optimize control schemes for electrical power systems to safely and effectively deliver power when and where it is needed on FVL aircraft. Will improve performance of energy storage systems through lighter packaging and improved controls. Will maximize energy and power density through use of hybrid schemes sized to support load demands. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Power & Thermal Management Tech Demo ***Description:*** Exploits fabrication, and systems integration lab validation testing to Technical Readiness Level (TRL) 6 of power and thermal management technologies to provide significantly higher electrical power capability to FVL aircraft while addressing thermal issues and reducing system weight/volume ***FY 2022 Plans:*** Will perform design of power and thermal management system components to reduce Size, Weight, and Power (SWaP) of target platforms. Will perform design integration efforts to optimally incorporate advanced system components into a power and thermal management system, providing increased electrical power capability and reduced weight, volume, and cost to Future Vertical Lift aircraft. ***FY 2023 Plans:*** Will continue to mature the power and thermal management system components which includes design integration efforts to optimally incorporate advanced system components into a power and thermal management system, providing increased electrical power capability while reducing weight, volume, and cost to Future Vertical Lift aircraft and the enduring fleet. Will perform fabrication of advanced power and thermal management system components to be used in component level and system level validation efforts. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle glide path of this effort with ramp up of design and fabrication efforts in FY23.	-	1.433	2.353
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:***	-	0.124	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CH7 / *Power & Thermal Management for FVL Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	3.402	4.396

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CH8 / *UAS Survivability Adv Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CH8: *UAS Survivability Adv Technology*	-	-	5.057	-	-	-	-	-	-	-	0.000	5.057
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned to: Program Element (PE) 0603465A Future Vertical Lift Advanced Technology / Project AK3 Aviation Survivability Advanced Technology and to Project CG1 Holistic Team Survivability Adv Tech.

A. Mission Description and Budget Item Justification

This Project integrates the new technologies of Future Vertical Lift and Air Platform Technologies to address an evolving threat environment by improving Unmanned Aircraft System (UAS) survivability in contested environments. This is achieved without impacting UAS performance through tailored signature management for UAS missions, survivability-enhanced mission profiles, UAS survivability behaviors, resilient systems and architectures and electromagnetic (EM) vulnerability reduction. UAS Survivability Advanced Technology will mature UAS survivability technologies and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance.

This research supports Future Vertical Lift and Advanced Unmanned Aircraft Systems.

Research in this Project is fully coordinated with Program element (PE) 0602148A (Future Vertical Lift Technology).

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: UAS Survivability Demonstration	-	4.872	-
Description: This effort focuses on maturing UAS susceptibility and vulnerability reduction technologies to provide increased UAS survivability with minimum impacts to mission performance and UAS system cost and addresses the evolving threat environment to support the Maneuver Force within the Multi-Domain Battle concept. Will develop and demonstrate increased UAS Survivability in a peer / near-peer environment with minimal impacts to aircraft performance, with objectives of tailored signature management for UAS missions, survivability-enhanced mission profiles, UAS survivability behaviors, resilient systems/architectures, and EM vulnerability reduction.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CH8 / *UAS Survivability Adv Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2022 Plans: Will mature Unmanned Air Systems survivability components for demonstration; will perform data collection to verify technology functionality; will continue to develop, for demonstration Unmanned Air Systems survivability susceptibility and vulnerability reduction technologies; will develop/leverage candidate capabilities concepts for mission effectiveness analysis. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** In FY23, this effort is realigned to PE 0603465A, Project AK3 Aviation Survivability Advanced Technology and to Project CG1Holistic Team Survivability Adv Tech.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.185	-
Accomplishments/Planned Programs Subtotals	-	5.057	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603465A / *Future Vertical Lift Advanced Technology*	Project (Number/Name) CJ5 / *Future Vertical Lift Medical Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CJ5: *Future Vertical Lift Medical Advanced Technology*	-	-	-	1.031	-	1.031	1.295	1.553	1.554	1.554	0.000	6.987
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year 2023 (FY23) this Project is realigned from:
Program Element (PE) 0602148A (Future Vertical Lift Technology)
Project BZ7 (Future Vertical Lift Medical Technologies)

A. Mission Description and Budget Item Justification

This Project evaluates, validates, matures and delivers medical guidelines and strategies to assure optimal Soldier performance and protection on the future technologically-intensive battlefield. Key elements of the program include: 1) tailored medical selection and retention standards for Future Vertical Lift (FVL); 2) medical strategies to maintain and enhance human performance in Multi-domain operations (MDO); 3) human-centered technology design guidance to accommodate the range of aircrew; 4) improved protection standards to reduce FVL occupant injury; and 5) operator state monitoring tools to enable scalable autonomy in FVL aircraft.

Efforts in this Project further develop work done in Program Element 0602148A (Future Vertical Lift Technology) / Project BZ7 (Future Vertical Lift Medical Technologies).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Biomedical Strategies to Support Design and Operation of Future Vertical Lift (FVL) Aircraft	-	-	1.031
Description: This effort evaluates, validates, matures and delivers medical guidelines and strategies to assure optimal Soldier performance and protection on the future technologically-intensive battlefield. Key elements of the program include: 1) tailored medical selection and retention standards for FVL; 2) medical strategies to maintain and enhance human performance in MDO.); 3) human-centered technology design guidance to accommodate the range of aircrew; 4) improved protection standards to reduce FVL occupant injury; and 5) operator state monitoring tools to enable scalable autonomy in FVL aircraft.			
FY 2023 Plans: Will validate Health Hazard Assessment methods and criteria to protect FVL occupants from Head Supported Mass, impulsive noise/ shock, and repeated jolt to maintain FVL occupant performance and prevent injury. Will validate human variables for operator state assessment and mature a holistic aircrew workload/ performance stress model. Validate recommendations for			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603465A / *Future Vertical Lift Advanced Technology*	**Project (Number/Name)** CJ5 / *Future Vertical Lift Medical Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Anthropomorphic Test Device (ATD) use in military environments. Validate revised spinal fracture thresholds and FVL aviator/ crew seat requirements. Validate standards for assessing flight helmet stability and crash retention. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Increase in funding due to realignment from Program Element 0602148A (Future Vertical Lift Technology) / Project BZ7 (Future Vertical Lift Medical Technologies) to support advanced technology research in this topic area.			
Accomplishments/Planned Programs Subtotals	-	-	1.031

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A