Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	130.108	104.348	73.844	-	73.844	70.486	62.163	70.978	63.016	0.000	574.943
AI9: *Future UAS Engine Technology*	-	3.014	-	-	-	-	-	-	-	-	0.000	3.014
AJ2: *Next Generation Rotorcraft Transmission Technology*	-	4.001	-	-	-	-	-	-	-	-	0.000	4.001
AJ6: *Advanced Rotors Technology*	-	2.358	-	-	-	-	-	-	-	-	0.000	2.358
AJ8: *Experimental and Computational Aeromechanics Techn*	-	5.753	-	-	-	-	-	-	-	-	0.000	5.753
AK2: *Aviation Survivability Technology*	-	2.081	1.236	-	-	-	9.908	6.492	-	-	0.000	19.717
AK4: *Multi-Role Small Guided Missile Technology*	-	3.599	-	-	-	-	-	-	-	-	0.000	3.599
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	13.468	14.546	14.863	-	14.863	14.868	14.882	14.892	15.054	0.000	102.573
AL2: *High Performance Computing for Rotorcraft App Tech*	-	1.126	-	-	-	-	-	-	-	-	0.000	1.126
AL4: *High Speed and Efficient VTOL Vehicle Technology*	-	1.412	-	-	-	-	-	-	-	-	0.000	1.412
AL5: *Air Vehicle Structures and Dynamics Technology*	-	2.696	-	-	-	-	-	-	-	-	0.000	2.696
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	0.857	-	1.004	-	1.004	3.017	3.020	-	-	0.000	7.898
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	42.000	35.000	-	-	-	-	-	-	-	0.000	77.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*							
BZ7: *Future Vertical Lift Medical Technologies*	-	7.818	7.503	7.644	-	7.644	7.449	7.443	7.564	7.662	0.000	53.083
CC3: *FVL Radar Technologies*	-	0.428	-	-	-	-	5.188	3.593	3.596	3.635	0.000	16.440
CG9: *Adapt & Resilnt Tact Autnmy Cont & Struct Tech*	-	6.270	-	-	-	-	-	-	-	-	0.000	6.270
CH2: *Air Launched Effects Technology*	-	7.291	4.168	4.312	-	4.312	3.483	3.383	3.280	-	0.000	25.917
CH3: *Holistic Team Survivability Technology*	-	10.808	10.819	11.041	-	11.041	11.044	11.057	11.065	11.110	0.000	76.944
CH4: *Power & Thermal Management for FVL Tech*	-	6.913	7.613	9.766	-	9.766	11.918	7.841	7.809	7.893	0.000	59.753
CI4: *Adaptive Avionics Technologies*	-	-	-	1.005	-	1.005	3.611	3.615	3.618	3.657	0.000	15.506
CI5: *High Speed Maneuverable Missile (HSMM) Tech*	-	8.215	23.463	24.209	-	24.209	-	0.837	19.154	14.005	0.000	89.883

Note

In Fiscal Year (FY) 2024, this Program Element (PE) is increased to research technologies directly supporting Future Vertical Lift modernization priorities.

A. Mission Description and Budget Item Justification

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

Research in this PE contributes to the Army Science and Technology (S&T) air systems portfolio and is fully coordinated with efforts in PE 0603465A (Future Vertical Lift Advanced Technology), PE 0602183A (Air Platform Applied Research) and PE 0603043A (Air Platform Advanced Technology).

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).

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602148A *I Future Verticle Lift Technology*

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	133.158	69.348	70.393	-	70.393
Current President's Budget	130.108	104.348	73.844	-	73.844
Total Adjustments	-3.050	35.000	3.451	-	3.451
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	35.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.050	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	3.451	-	3.451

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: BP7: *Future Vertical Lift Air Platform Tech (CA)*		
Congressional Add: *Program Increase - High Strength Functional Composites*	5.000	5.000
Congressional Add: *Program Increase: Adaptive Flight Control Technology*	7.000	3.000
Congressional Add: *Program Increase - High Density eVTOL Power Source*	15.000	-
Congressional Add: *Program Increase - Individual Blade and Higher Harmonic Control*	5.000	-
Congressional Add: *Missile Technology Transfer and Innovation*	5.000	-
Congressional Add: *Rotor Blade Operational Readiness*	5.000	-
Congressional Add: *Program Increase - DIGITAL TWIN PATHFINDER*	-	17.000
Congressional Add: *Program Increase - SEAT TRACK INTEGRATED REPLACEABLE/UPGRADABLE PROTECTION SYSTEM*	-	10.000
Congressional Add Subtotals for Project: BP7	42.000	35.000
Congressional Add Totals for all Projects	42.000	35.000

Change Summary Explanation

In FY24, funding is increased to support research in Aviation Survivability, Holistic Situational Awareness and Decision Making, Power & Thermal Management, and Adaptive Avionic technologies to support Future Vertical Lift priorities

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AI9 / *Future UAS Engine Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AI9: *Future UAS Engine Technology*	-	3.014	-	-	-	-	-	-	-	-	0.000	3.014

A. Mission Description and Budget Item Justification

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

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

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 2022	FY 2023	FY 2024
Title: Multi-fuel Capable Hybrid Electric Propulsion	3.014	-	-
Description: Applied research to enable intelligent and robust propulsion performance and noise signature reduction via multi-fuel and optimized hybrid electric capability for small engines (20kW to 150kW) powering future aircraft systems. The research focuses on the establishment of concepts to enable reduced fuel consumption, engine size, weight, and cost as well as improved group 3 and 4 FUAS reliability, survivability, and maintainability.			
Accomplishments/Planned Programs Subtotals	3.014	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ2 / *Next Generation Rotorcraft Transmission Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AJ2: *Next Generation Rotorcraft Transmission Technology*	-	4.001	-	-	-	-	-	-	-	-	0.000	4.001

A. Mission Description and Budget Item Justification

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

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

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 2022	FY 2023	FY 2024
Title: High Reduction Ratio Transmission Components	4.001	-	-
Description: Effort investigates advanced materials and component designs that allow a 60:1 reduction ratio two-stage gearbox design that provides significant weight and volume reduction for extended range and component life for manned and unmanned applications.			
Accomplishments/Planned Programs Subtotals	4.001	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ6 / *Advanced Rotors Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AJ6: *Advanced Rotors Technology*	-	2.358	-	-	-	-	-	-	-	-	0.000	2.358

A. Mission Description and Budget Item Justification

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

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Advanced Hubs ***Description:*** Investigate advanced rotor system and hub technologies to support goals of increased speed and lift by developing configurations and technologies that reduce drag and enable more efficient rotor system performance.	2.358	-	-
Accomplishments/Planned Programs Subtotals	2.358	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AJ8 / *Experimental and Computational Aeromechanics Techn*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AJ8: *Experimental and Computational Aeromechanics Techn*	-	5.753	-	-	-	-	-	-	-	-	0.000	5.753

A. Mission Description and Budget Item Justification

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

Research in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced 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 effort is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Experimental Aeromechanics for FVL ***Description:*** Develop and explore new methods to simulate aerodynamic effects for future FVL configurations.	3.632	-	-
Title: Computational Aeromechanics for FVL ***Description:*** Investigate experimental aeromechanics technologies and test methods for FVL.	2.121	-	-
Accomplishments/Planned Programs Subtotals	5.753	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK2 / *Aviation Survivability Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AK2: *Aviation Survivability Technology*	-	2.081	1.236	-	-	-	9.908	6.492	-	-	0.000	19.717

A. Mission Description and Budget Item Justification

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

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Tunable Pyrotechnics Technologies	2.081	1.191	-
Description: Develop and investigate technologies for nano, reactive, and advanced/novel materials to enable, customize and "tune" a family of Countermeasure Decoys for FVL platforms.			
FY 2023 Plans: Conduct experiments on miniaturized electronics and antenna for active Radio Frequency countermeasure technologies. Design and develop modeling and simulation techniques supporting countermeasure development and future applications.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned lifecycle conclusion of this effort.			
Title: SBIR/STTR Transfer	-	0.045	-
Description: Funding transferred in accordance with Title 15 USC §638			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK2 / *Aviation Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	2.081	1.236	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK4 / *Multi-Role Small Guided Missile Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AK4: *Multi-Role Small Guided Missile Technology*	-	3.599	-	-	-	-	-	-	-	-	0.000	3.599

A. Mission Description and Budget Item Justification

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

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

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 2022	FY 2023	FY 2024
Title: Multiple Simul Engagement Technologies (MSET) ***Description:*** Investigate critical missile and fire control component technologies and designs for future missiles that can be launched simultaneously, can operate autonomously and/or under human supervision, and can form advanced, cooperative teams to defeat one or more hard/soft targets which are stationary and/or moving targets.	3.599	-	-
Accomplishments/Planned Programs Subtotals	3.599	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AK9 / *Adv Teaming for Tactical Aviation Operations Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	13.468	14.546	14.863	-	14.863	14.868	14.882	14.892	15.054	0.000	102.573

A. Mission Description and Budget Item Justification

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

Research in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 2022	FY 2023	FY 2024
Title: Advanced Teaming Concepts	8.052	8.495	8.715
Description: Investigates and develops subsystem and component level technologies that enable advanced manned and unmanned teaming behaviors for mixed air and ground platform formations in combined arms operations. ***FY 2023 Plans:*** Design autonomy and teaming technologies that enable seamless unmanned aircraft systems (UAS) team of teams operations, including dynamic retasking with autonomous team reconfigurability, across multiple domains and in highly-contested, complex environments. Design and enhance technologies for team coordination over long ranges with degraded networks and autonomous navigation in featureless (e.g. water) or highly cluttered (e.g. urban) environments. ***FY 2024 Plans:*** Will investigate and develop technologies that enhance autonomous team of teams operations in complex urban / fringe and littoral environments, including highly-autonomous coordinated team mission behaviors, navigation and mission execution at low altitude in featureless and cluttered terrain, and sophisticated behaviors for employment of targeted electronic attack using teams of UAS. Will further enhance technologies for collaborative team operations over extended ranges with degraded networks, and improve human to machine supervisory interfaces for complex dynamic UAS team operations. ***FY 2023 to FY 2024 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AK9 / *Adv Teaming for Tactical Aviation Operations Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding change reflects planned lifecycle of this effort.			
Title: Enhanced Optics for Long Range Targeting	5.416	6.051	6.148
Description: This effort will deliver advanced airborne optics and reconfigurable filtering devices to enable agile, multi-task sensors for compact, long-range targeting, enhanced survivability and lethality of the Future Vertical Lift (FVL) and Future Unmanned Aircraft System (FUAS). This effort will restore visual overmatch in any (day/night) environment through visual penetration of all obscurants (e.g. brownout, white out, engineered smokescreens) from a single sensor, as well as narrowband filtering for active imaging through obscurants while maintaining advanced target acquisition. Improved detection and identification and long range target acquisition capability will result from filtering out scattered light and enabling 3-dimensional ranging through environmental obscurants. ***FY 2023 Plans:*** Conduct experiments on the efficacy, performance, and durability of newly available optical materials. Validate optical performance of field-selectable spectral bandpass filters to determine impacts to multiple tasks needed in a dynamic airborne environment. Mature optical lens material manufacturability of novel dual-band crystalline materials for use in advanced targeting applications. Conduct experiments to determine the range resolution achievable for day/night airborne active 3-D imaging. ***FY 2024 Plans:*** Will validate the new dual band infrared (IR) optical material in a relevant lens design; enabling lower size, weight, and power - cost (SWaP-C), improved durability, and dual-band flexibility. Will develop a compact and lightweight optical design, and novel optical components to support scalable long-range electro-optic infrared (EOIR) sensor payloads on current and future low-SWAP unmanned air platforms. Will determine applicable payload pointing and stabilization approaches to pair with the optical payload design to meet platform constraints. Will investigate feasibility of multi-spectral payload designs for small unmanned platforms. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	13.468	14.546	14.863

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL2 / *High Performance Computing for Rotorcraft App Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AL2: *High Performance Computing for Rotorcraft App Tech*	-	1.126	-	-	-	-	-	-	-	-	0.000	1.126

A. Mission Description and Budget Item Justification

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

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: High Performance Computing for Rotorcraft App Tech ***Description:*** Investigate new high performance and parallel computing efforts in support of FVL platforms.	1.126	-	-
Accomplishments/Planned Programs Subtotals	1.126	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL4 / *High Speed and Efficient VTOL Vehicle Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AL4: *High Speed and Efficient VTOL Vehicle Technology*	-	1.412	-	-	-	-	-	-	-	-	0.000	1.412

A. Mission Description and Budget Item Justification

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

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: High Speed & Efficient Vertical Take-off and Landing ***Description:*** This research effort establishes concepts in vertical take-off and landing in the area of propulsion to enable improved, efficient hover and high-speed cruise at longer range without added weight.	1.412	-	-
Accomplishments/Planned Programs Subtotals	1.412	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) AL5 / *Air Vehicle Structures and Dynamics Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AL5: *Air Vehicle Structures and Dynamics Technology*	-	2.696	-	-	-	-	-	-	-	-	0.000	2.696

A. Mission Description and Budget Item Justification

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

Research in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced 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 effort is performed by the United States (US) Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Aeromechanics and Aeroelasticity of Future Air Vehicle Platforms	2.696	-	-
Description: Establish improved experimentally validated modeling tools and methodologies that can be used to understand the physics of aeroelastic stability and design in next generation rotorcraft platform configurations for FVL platforms. This involves the development of an experimental capability, (TRAST), which will be used to generate novel experimental data. This data will be used to increase fundamental understanding of the whirl flutter instability, which currently limits the high speed performance of tiltrotor rotorcraft. This effort will inform FVL requirement definition and technology maturation. This effort also establishes low noise rotor concepts and investigates the intersection of artificial intelligence and classical mechanics to enable novel mechanics and new approaches in structural dynamics for FVL applications to enable higher Operating Tempo (OPTEMPO) operations.			
Accomplishments/Planned Programs Subtotals	2.696	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*				Project (Number/Name) AL8 / *Holistic Situational Awareness and Dec Making Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	0.857	-	1.004	-	1.004	3.017	3.020	-	-	0.000	7.898

Note

In Fiscal Year (FY) 2024, funding for this project is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) / Project AL9 (Holistic Sit Awareness and Dec Making Adv Tech).

A. Mission Description and Budget Item Justification

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

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

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Situational Awareness Radar for DVE mitigation ***Description:*** This effort investigates technologies and algorithms for compact radars that will provide a hazard warning capability to airborne platforms in all environmental conditions, including those with zero visibility. This hazard warning capability will detect collision threats and specific projectile hazards around the entire aircraft using a suite of small form-factor radars. Algorithms are created to interpret the data produced by these radars and distinguish threats from benign clutter. Innovative radar architectures and device technologies are investigated and demonstrated to enhance and extend performance.	0.857	-	-
Title: Holistic Mission Manager (HMM) Concepts ***Description:*** Increase FVL (FARA, FLRAA) mission effectiveness by an order of magnitude by merging existing Mission Systems Division MOSA technologies (HSA-DM, SAINT, A-Team, IME) into a single, ownship-centric mission manager. Dynamically load-balance the ownship, optimizing actions within the mission-team space. Increase lethality through mission effectiveness achieved	-	-	1.004

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** AL8 / *Holistic Situational Awareness and Dec Making Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
by better crew workload management and mission management that coordinates all aspects of ownship mission requirements. Interoperability with all MDO players. ***FY 2024 Plans:*** Will survey government, industry, and academia to identify gaps and report on the existing and emerging mission planning/ management tools; conduct stakeholder engagements and program planning activities; develop and coordinate a request for information. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort begins in FY24 with funding realigned from PE 0603465 (Future Vertical Lift Advanced Technology) / Project AL9 (Holistic Sit Awareness and Dec Making Adv Tech).			
Accomplishments/Planned Programs Subtotals	0.857	-	1.004

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) BP7 / *Future Vertical Lift Air Platform Tech (CA)*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	42.000	35.000	-	-	-	-	-	-	-	0.000	77.000

Note

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

A. Mission Description and Budget Item Justification

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
Congressional Add: Program Increase - High Strength Functional Composites ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for High Strength Functional Composites ***FY 2023 Plans:*** Congressional Interest Item funding provided for High Strength Functional Composites	5.000	5.000
Congressional Add: Program Increase: Adaptive Flight Control Technology ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Adaptive Flight Control Technology ***FY 2023 Plans:*** Congressional Interest Item funding provided for Adaptive Flight Control Technology	7.000	3.000
Congressional Add: Program Increase - High Density eVTOL Power Source ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for High Density eVOTL Power Source	15.000	-
Congressional Add: Program Increase - Individual Blade and Higher Harmonic Control ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Individual Blade and Higher Harmonic Control	5.000	-
Congressional Add: Missile Technology Transfer and Innovation	5.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** BP7 / *Future Vertical Lift Air Platform Tech (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: Congressional Interest Item funding provided for Missile Technology Transfer and Innovation		
Congressional Add: Rotor Blade Operational Readiness ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Rotor Blade Operational Readiness	5.000	-
Congressional Add: Program Increase - DIGITAL TWIN PATHFINDER ***FY 2023 Plans:*** Congressional Interest Item funding provided for Digital Twin Pathfinder	-	17.000
Congressional Add: Program Increase - SEAT TRACK INTEGRATED REPLACEABLE/UPGRADABLE PROTECTION SYSTEM ***FY 2023 Plans:*** Congressional Interest Item funding provided for SEAT TRACK INTEGRATED REPLACEABLE/ UPGRADABLE PROTECTION SYSTEM	-	10.000
Congressional Adds Subtotals	42.000	35.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) BZ7 / *Future Vertical Lift Medical Technologies*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BZ7: *Future Vertical Lift Medical Technologies*	-	7.818	7.503	7.644	-	7.644	7.449	7.443	7.564	7.662	0.000	53.083

A. Mission Description and Budget Item Justification

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

The cited 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 2022	FY 2023	FY 2024
Title: Medical Standards to Support Future Vertical Lift (FVL)	7.818	7.496	7.644
Description: This effort develops 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 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. ***FY 2023 Plans:*** Will refine Army Regulation Update 40-501 to ensure medically fit aircrew. Will develop Health Hazard Assessment methods and criteria to protect FVL occupants from Head Supported Mass, impulsive noise/ shock, and repeated jolt. Will develop recommendations for multisensory cuing for Degraded Visual Environment (DVE) operations. Will develop recommended human variables for operator state assessment and a holistic aircrew workload/ performance stress model. Will refine spinal fracture thresholds and FVL aviator/crew seat requirements. Will improve standards for assessing flight helmet stability and crash retention; Will assess FVL flight envelope physiological effects and countermeasures. Will develop proposed responses of autonomous system to FVL aircrew. Will develop recommendation package for enhanced FVL crashworthiness. ***FY 2024 Plans:*** Will develop Health Hazard Assessment methods and criteria to protect FVL occupants from Head Supported Mass, impulsive noise/ shock, and repeated jolt. Will develop recommendations for maintaining orientation in Manned-Unmanned Teaming			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** BZ7 / *Future Vertical Lift Medical Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
(MUM-T) and FVL operators. Will develop recommendations for multisensory cuing for Degraded Visual Environment (DVE) operations. Will develop recommendations for counter-measures for motion sickness in Soldiers transported by FVL. Will assess FVL flight envelope physiological effects and recommend countermeasures. Will assess FVL vibration effects on aircrew health and performance. Will recommend updated head supported mass (HSM) limits to prevent injury and maintain FVL aircrew performance. Will develop recommended human variables for operator state assessment and a holistic aircrew workload/ performance stress model. Will develop input for human behavior and biomedical monitoring algorithms. Will develop medical aspects of FVL scalable autonomy system incorporating real-time biomedical monitoring inputs. Will develop recommendations for hearing protection of FVL aircrew, operators, and passengers. Will update recommended head supported mass (HSM) limits to prevent FVL aircrew injury. Will develop next-generation head protection strategies for FVL aircrew. Will develop recommendation package for enhanced FVL crashworthiness. Efforts in this task are further developed in Program Element 060465A, Project CJ5. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort..			
Title: SBIR/STTR Transfer ***FY 2023 Plans:*** SBIR/STTR Transfer ***FY 2023 to FY 2024 Increase/Decrease Statement:*** SBIR/STTR Transfer	-	0.007	-
Accomplishments/Planned Programs Subtotals	7.818	7.503	7.644

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CC3 / *FVL Radar Technologies*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CC3: *FVL Radar Technologies*	-	0.428	-	-	-	-	5.188	3.593	3.596	3.635	0.000	16.440

A. Mission Description and Budget Item Justification

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

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Battlefield Surveillance & Targeting Radar Technology	0.428	-	-
Description: Advanced Reconnaissance, Surveillance and Target Acquisition Waveform Designs for advanced multi-beam Ground Moving Target Indicator (GMTI) and Synthetic Aperture Radar (SAR) systems.			
Accomplishments/Planned Programs Subtotals	0.428	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technol ogy*	Project (Number/Name) CG9 / *Adapt & Resilnt Tact Autnmy Cont & Struct Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CG9: *Adapt & Resilnt Tact Autnmy Cont & Struct Tech*	-	6.270	-	-	-	-	-	-	-	-	0.000	6.270

A. Mission Description and Budget Item Justification

This Project develops methodologies for advanced flight dynamics models, robust flight controls for superior handling qualities, and improved survivability, redundancy management with reduced structural loads on the aircraft. Designs algorithms for autonomy, optionally piloted operations and manned-unmanned teaming. This Project directly supports Future Vertical Lift (FVL) modernization priority capabilities by investigating, maturing, and harmonizing leap-ahead autonomy, structures, and controls technologies, concepts, and capabilities which enable combat mission success across the family of manned/unmanned FVL platforms.

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

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 2022	FY 2023	FY 2024
Title: Adaptive and Resilient Engineered Structures (ARES) Technologies ***Description:*** Develop 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.	1.501	-	-
Title: Adaptive Tactical Autonomy and Control (ATAC) Technologies ***Description:*** Develop 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.	4.769	-	-
Accomplishments/Planned Programs Subtotals	6.270	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CG9 / *Adapt & Resilnt Tact Autnmy Cont & Struct Tech*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CH2 / *Air Launched Effects Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CH2: *Air Launched Effects Technology*	-	7.291	4.168	4.312	-	4.312	3.483	3.383	3.280	-	0.000	25.917

A. Mission Description and Budget Item Justification

This Project utilizes improved analytic modeling to investigate the effects that potential unmanned system capabilities could have on air vehicle design considerations and operational concepts. This Project improves government capability to design and assess novel Unmanned Aircraft System (UAS) concepts. This Project also develops and investigates the ability to launch a UAS from a manned or unmanned future vertical lift aircraft at tactical altitudes and to control the same after launch from nearby Future Verticle Lift (FVL) aircraft, as well as development of the associated payloads (recon, battle damage assessment, targeting, comms, decoy). This Project will assess the enabled capabilities and determine their relevance to current Army Aviation engagement and survivability portfolios.

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 2022	FY 2023	FY 2024
Title: Systems Concepts Studies for Air Launched Effects	7.291	4.065	4.312
Description: Investigates and models air vehicle concepts to understand the effects that potential operational Air Launched Effects capabilities will have on air vehicle properties. ***FY 2023 Plans:*** Conduct assessment of vehicle concepts and technology for Versatile Air Launched Effects. Develop UAS component models to improve propulsion architecture modeling, aircraft weight prediction, and improve performance and cost assessment. ***FY 2024 Plans:*** Will explore tradespace for air vehicle concepts with application to FUAS and ALE. Will develop models to estimate performance, improve methods for cost analysis, and incorporate improved propulsion models. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: SBIR/STTR Transfer	-	0.103	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CH2 / *Air Launched Effects Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	7.291	4.168	4.312

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CH3 / *Holistic Team Survivability Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CH3: *Holistic Team Survivability Technology*	-	10.808	10.819	11.041	-	11.041	11.044	11.057	11.065	11.110	0.000	76.944

A. Mission Description and Budget Item Justification

This Project will investigate and design advanced survivability technologies to develop a holistic team-based solution that delivers advanced sensing and electronic warfare (EW) effects across a family of aircraft to optimally penetrate and survive in the anti-access/area denial (A2AD) environment. This Project will take an integrated team-based system of systems survivability approach through a purpose-driven mix of improved survivability situational awareness, signature management, vulnerability reduction, enhanced platform survivability against directed energy munitions, route and maneuver optimization, expendables, advanced sensors, and electro-optics (EO) & radio frequency (RF) jamming for existing and future air platforms. This Project will also provide advanced teaming algorithms for survivability. This Project develops and evaluates multi layered survivability concepts and supporting technologies for increased survivability of Future Vertical Lift (FVL) Family of Systems (FVL FoS) in an advanced and evolving integrated air defense systems environment.

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 2022	FY 2023	FY 2024
Title: Advanced Survivability Concepts	4.036	3.362	3.464
Description: This effort will provide analysis of the rapidly evolving and emerging threat environment and impacts to Future Vertical Lift Family of Systems FVL FoS platforms, developing and evaluating full spectrum survivability concept, collaborative team based survivability algorithms and behaviors			
FY 2023 Plans: Investigate damage prediction algorithms given a threat/ballistic impact. Investigate RF materials development for durability improvement and weight reduction. Continue development of algorithms, behaviors, and human machine interface for team-based survivability. Begin investigation and analysis of Electro Optical/ Infrared coatings for FVL applications, leveraging new coatings technologies.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CH3 / *Holistic Team Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will initiate the development of damage prediction algorithms given a threat/ballistic impact. Will develop RF material coupons for durability improvement and weight reduction. Will continue development and maturation of algorithms, behaviors, and human machine interface for team-based survivability. Will continue the development and analysis of uniquely tailored Electro-Optical/ Infrared coatings for FVL and UAS applications, leveraging emergent coatings technologies. Will investigate microclimatology for survivability algorithm development. Will investigate emergent fuel cell vulnerability reduction technologies for next generation FVL platforms. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Distributed Electronic Warefare Effects ***Description:*** This effort investigates and develops critical EW components and techniques to enable the FVL capability to operate and survive in A2/AD environments. It provides scalable low size, weight, power, and cost (SWaP-C) signal processing components and decision-making algorithms that adapt and counter the characteristics of advanced and emerging threats. ***FY 2023 Plans:*** Conduct single node bench experimentation of hardware performance and software algorithm functionality to inform further development and optimization. Validate software technology readiness level assessments. Optimize operational capability of a payload based on technology maturation and EW technical community inputs. ***FY 2024 Plans:*** Will mature algorithms and conduct multi-node experiment of hardware performance and software algorithm functionality. Will develop methods for distributed detection and geolocation of A2/AD threats with enhanced accuracy. Will investigate the impact of threat progression on measured performance of detection and countermeasure algorithms in both the single node and multi-node cases. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	6.772	7.329	7.577
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:***	-	0.128	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CH3 / *Holistic Team Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	10.808	10.819	11.041

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CH4 / *Power & Thermal Management for FVL Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CH4: *Power & Thermal Management for FVL Tech*	-	6.913	7.613	9.766	-	9.766	11.918	7.841	7.809	7.893	0.000	59.753

A. Mission Description and Budget Item Justification

This Project directly supports Future Vertical Lift (FVL) Modernization Priority capabilities by investigating and developing power and thermal management technologies to provide significantly higher electrical power capability to FVL aircraft while addressing consequential size, weight, and thermal issues. This Project provides power capability for advanced electric aeromechanical effectors, advanced mission systems algorithms for route planning and teaming, and advanced electronic warfare devices. This also Project investigates emerging electrical power generation and distribution, energy storage, and thermal management technologies needed for future Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) and survivability equipment for application to FVL and other Army platforms. Enables significantly increased aircraft electrical power capability for advanced electric aeromechanical effectors, advanced mission systems to include algorithms for route planning and teaming, and for advanced electronic warfare devices while minimizing size and weight.

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 2022	FY 2023	FY 2024
Title: Optimized Energy for C5ISR Platforms	4.726	5.058	5.270
Description: This effort investigates electrical power and thermal management associated with high power C5ISR capabilities on ground and air platforms enabling enhanced mobility and mission flexibility. This effort funds research to improve FVL aircraft and other Army platforms power efficiency through the use of on-demand hybrid electrical power architectures, while also researching ways to eliminate platform thermal constraints. This effort will also investigate safer battery chemistries which enable very high density electrical power sources and energy storage to be flight certified for high rate pulsed power, electrical power management, and thermal management for dynamic high rate pulsed power.			
FY 2023 Plans: Investigate intrinsically safe chemistries for energy storage components able to deliver light weight, high energy power to support aviation electronic warfare capabilities. Mature thermal management components to support rejection of waste heat generated by platform mission equipment. Conduct experiments on real world thermal management components in order to validate models. Investigate advanced cold plate designs for two-phase heat rejection to reduce size, weight, and power draw. Conduct			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CH4 / *Power & Thermal Management for FVL Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
experiments on thermal energy storage using phase change materials to better manage waste heat from high heat flux loads. Investigate efficient power electronics which will further reduce the waste heat generated by the aircraft. ***FY 2024 Plans:*** Will mature safe silicon chemistry components to develop and enable light weight, high power aviation energy storage systems. Will validate thermal management components through real world assessment to drive rejection of waste heat generated by platform mission equipment. Will?mature?cold plate designs and conduct experiments on novel phase change materials capable of managing peak thermal loads. Will design and develop power management strategies and algorithms for vertical lift platforms to efficiently distribute electrical power. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: Power & Thermal Management Components ***Description:*** This effort develops electrical power and thermal management component technologies to meet the power and thermal demands of Future Vertical Lift aircraft while minimizing system size and weight. Technology will be validated through component level test. ***FY 2023 Plans:*** Perform fabrication and validation testing of efficient, distributed, and adaptable cooling systems that enable increased electrical power capability while reducing weight and cost to Future Vertical Lift aircraft electrical power and thermal management systems. Perform design of power dense generator technology thereby reducing system weight and volume while improving system efficiency and reliability for future and enduring fleets. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort ends in FY23 and funding is realigned to Adaptive Power Component Technologies within this project.	2.187	2.368	-
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.187	-
Title: Adaptive Power Component Technologies	-	-	2.486

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CH4 / *Power & Thermal Management for FVL Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort develops adaptive propulsion and power system component technologies to provide highly efficient propulsion and power capability to FVL aircraft while addressing consequential SWAP & thermal issues. Technology will be validated through component level test. ***FY 2024 Plans:*** Will perform detailed design and system integration modeling and analysis of adaptive power technologies that can provide key capabilities for a future hybrid propulsion system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort begins in FY24 with funding realigned from Power& Thermal Management Components within this project.			
Title: Hybrid Propulsion Conceptual Design Analysis ***Description:*** Explore design and development of hybrid-electric propulsion concepts / applications (conventional & non-conventional) for multiple manned-VTOL classes to achieve greatest operational benefit for FVL future Platforms. Analysis will include trade studies to identify metrics, best architectures/technologies/configurations, and demonstration path for improved FVL aircraft capability. ***FY 2024 Plans:*** Will conduct component and system modeling. Will perform down-select of initial hybrid electric propulsion concepts as applied to FVL/enduring aircraft configurations to be investigated and initiate trade-studies/benefit analysis (key metrics include weight, system complexity, fuel burn, and electrical efficiency). ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort begins in FY24.	-	-	2.010
Accomplishments/Planned Programs Subtotals	6.913	7.613	9.766

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CI4 / *Adaptive Avionics Technologies*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CI4: *Adaptive Avionics Technologies*	-	-	-	1.005	-	1.005	3.611	3.615	3.618	3.657	0.000	15.506

Note

Adaptive Avionics Technologies is a new start within the Future Verticle Lift Technology program in FY 2024.

In Fiscal Year (FY) 2024, funding for this project is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology) / Project AL9 (Holistic Sit Awareness and Dec Making Adv Tech).

A. Mission Description and Budget Item Justification

This Project will Build on Modular Open Systems Approach (MOSA) successes to enable future aviation mission systems to proactively exploit emerging innovation from multiple technological domains, employing continuous development and continuous deployment by researching and developing advanced avionics integration techniques and optimized processing management.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Future Avionics Implementation Research (FAIR)	-	-	1.005
Description: This effort will investigate evolving advanced avionics technologies and integration techniques in disparate environments for FVL mission systems, and will research complex computing environments, contextual resource management and ownship network technologies to implement on FVL air platforms. ***FY 2024 Plans:*** Will conduct trade studies and internal research to understand the state of the art with respect to computing resource management techniques using contextual based situational awareness, innovative and flexible data architectures, distributed data processing and advanced ship network technologies. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort begins in FY24 with funding realigned from PE 0603465A Future Vertical Lift Advanced Technology/ Project AJ9 Integ Mission Equip for Vert Lift Systems Adv Tech.			
Accomplishments/Planned Programs Subtotals	-	-	1.005

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CI4 / *Adaptive Avionics Technologies*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602148A / *Future Verticle Lift Technology*	Project (Number/Name) CI5 / *High Speed Maneuverable Missile (HSMM) Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CI5: *High Speed Maneuverable Missile (HSMM) Tech*	-	8.215	23.463	24.209	-	24.209	-	0.837	19.154	14.005	0.000	89.883

A. Mission Description and Budget Item Justification

The Project investigates, designs, and evaluates missile component technologies compatible with Future Vertical Lift (FVL) and Future Unmanned Aircraft Systems (FUAS) aviation platforms in a Multi-Domain Battle/Cross-domain Maneuver operational environment. Efforts provide technologies to support a smaller, faster, maneuverable missile capable of long range non-line-of-sight attack in contested/degraded environments. Technology development increases aviation lethality and platform survivability by increasing missile standoff range, speed, and maneuverability, a faster rate of fire, shorter times of flight, and multi-threat lethal effects. Enables cross domain applications for aviation and ground vehicle platforms, including handoff capability, to engage threats in dead zones, and to operate in contested environments.

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced 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 2022	FY 2023	FY 2024
Title: High Speed Maneuverable Missile (HSMM) Technology	8.215	22.607	24.209
Description: Efforts provide technology development to support a maneuverable missile capable of both short range direct attack and long range non-line-of-sight attack with reduced time to target; reduced size and weight for increased load-out; capable of air launched missions in degraded/contested environments.			
FY 2023 Plans: Continue component development and evolve critical component designs including navigation sensors, warheads, fire control, and digital missile datalinks. Advance the design and development of a missile test bed. Develop detailed design of the advanced propulsion system to increase range and speed with desired trajectory for effectiveness and survivability. Assess that detailed designs accurately reflect platform interfaces and requirements to include maneuverability, long range precision strike capability in degraded/contested environments, and reduced time to target.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CI5 / *High Speed Maneuverable Missile (HSMM) Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will conduct experiments to validate the critical component designs including navigation sensor, warheads, fire control, and digital missile datalinks. Will conduct experiments to validate the design and development of the missile test bed. Will use the missile test bed to investigate increases in maneuverability, aviation lethality, and platform survivability in degraded/contested environments. Will validate detailed design of the advanced propulsion system and technologies by optimizing increases in range and speed to support long range precision strike performance in degraded/contested environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.856	-
Accomplishments/Planned Programs Subtotals	8.215	23.463	24.209

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A