Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army											Date: March 2024	
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 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
Total Program Element	-	103.022	73.844	52.685	-	52.685	53.269	67.099	58.618	48.639	0.000	457.176
AK2: *Aviation Survivability Technology*	-	1.191	-	-	-	-	-	-	-	-	0.000	1.191
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	14.546	14.863	14.898	-	14.898	14.911	14.921	15.083	15.235	0.000	104.457
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	-	1.004	3.023	-	3.023	3.026	-	-	-	0.000	7.053
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	35.000	-	-	-	-	-	-	-	-	0.000	35.000
BZ7: *Future Vertical Lift Medical Technologies*	-	7.496	7.644	7.460	-	7.460	7.452	7.573	7.671	7.750	0.000	53.046
CC3: *FVL Radar Technologies*	-	-	-	5.198	-	5.198	3.600	2.100	1.638	1.173	0.000	13.709
CH2: *Air Launched Effects Technology*	-	4.065	4.312	2.087	-	2.087	3.390	3.286	-	-	0.000	17.140
CH3: *Holistic Team Survivability Technology*	-	10.691	11.041	11.066	-	11.066	11.079	11.087	11.132	11.243	0.000	77.339
CH4: *Power & Thermal Management for FVL Tech*	-	7.426	9.766	5.335	-	5.335	5.350	5.316	5.398	5.453	0.000	44.044
CI4: *Adaptive Avionics Technologies*	-	-	1.005	3.618	-	3.618	3.622	3.625	3.664	3.701	0.000	19.235
CI5: *High Speed Maneuverable Missile (HSMM) Tech*	-	22.607	24.209	-	-	-	0.839	19.191	14.032	4.084	0.000	84.962

Note

In Fiscal Year (FY) 2025, project CC3 / FVL Radar Technologies is a new start.

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army	Date: March 2024
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*

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.

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	104.348	73.844	70.486	-	70.486
Current President's Budget	103.022	73.844	52.685	-	52.685
Total Adjustments	-1.326	0.000	-17.801	-	-17.801
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.002	-			
• SBIR/STTR Transfer	-1.328	-			
• Adjustments to Budget Years	-	-	-17.801	-	-17.801

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: BP7: *Future Vertical Lift Air Platform Tech (CA)*		
Congressional Add: *Program Increase - High Strength Functional Composites*	5.000	-
Congressional Add: *Program Increase: Adaptive Flight Control Technology*	3.000	-
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	35.000	-
Congressional Add Totals for all Projects	35.000	-

Change Summary Explanation

In Fiscal Year (FY) 2025 a portion of this Program Element (PE) is restructured to Project 0602183A (Air Platform Applied Research) / Project DK1 (Air Vehicle Integrated & Alternative Tech (AVIATe).

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
AK2: *Aviation Survivability Technology*	-	1.191	-	-	-	-	-	-	-	-	0.000	1.191

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 Armaments Center (AC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Tunable Pyrotechnics Technologies ***Description:*** Develop and investigate technologies for nano, reactive, and advanced/novel materials to enable, customize and "tune" a family of Countermeasure Decoys for FVL platforms.	1.191	-	-
Accomplishments/Planned Programs Subtotals	1.191	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army											Date: March 2024	
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 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
AK9: *Adv Teaming for Tactical Aviation Operations Tech*	-	14.546	14.863	14.898	-	14.898	14.911	14.921	15.083	15.235	0.000	104.457

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), Project AL1 (Adv Teaming for Tactical Aviation Oper Adv Tech).

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 Aviation & Missile Center (AvMC), and Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Advanced Teaming Concepts	8.495	8.715	8.708
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 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 2025 Plans:*** Will further develop a suite of technologies that enable UAS team-o- teams ecosystem operations in contested, complex urban / fringe and littoral environments with degraded networks. Will develop autonomy and teaming technologies that build in behavior resilience to dynamically adjust to component failures and enhance contingency management for extended durations without			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
human intervention required. Will begin designing domain-specific data generation and training methods to develop learning-based solutions for risk-informed course of action selection and decision aiding of human supervisor. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle of this effort.			
Title: Enhanced Optics for Long Range Targeting ***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 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 2025 Plans:*** Will mature the new dual band infrared (IR) optical material Calcium Lanthanum Sulfide (CLS) and conduct experiments with complex dual-band optics representative of fielded high performance targeting sensors. Will mature infrared sensor optics packages suitable for low SWaP-C gimbal integration for small-unmanned aerial vehicle (UAV) and launched effects platforms. Will conduct experiments with infrared optics packages against Commercial off the Shelf (COTS) EOIR payloads. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding increase is an economic adjustment.	6.051	6.148	6.190
Accomplishments/Planned Programs Subtotals	14.546	14.863	14.898

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
AL8: *Holistic Situational Awareness and Dec Making Tech*	-	-	1.004	3.023	-	3.023	3.026	-	-	-	0.000	7.053

A. Mission Description and Budget Item Justification

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

Work in this Project is fully coordinated with PE 0603465A (Future Vertical Lift Advanced Technology Development), Project AL9 (Holistic Sit Awareness and Dec Making Adv Tech).

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 Aviation & Missile Center (AvMC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Holistic Mission Manager (HMM) Concepts	-	1.004	3.023
Description: Increase Future Vertical Lift (FVL) 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 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 2025 Plans: Will engage with Academia, Industry, and other DOD agencies to initiate research for the integration of the relevant technology outputs from applicable S&T programs into a holistic mission manager for FVL platforms.			
FY 2024 to FY 2025 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
FY25 funding increase reflects an increase in relevant research activities with Academia, Industry, and other DOD agencies in areas such as current mission planning tools (AMPS and JMPS), and novel methods of mission planning and team coordination (ATAK) and other emerging technologies.			
Accomplishments/Planned Programs Subtotals	-	1.004	3.023

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
BP7: *Future Vertical Lift Air Platform Tech (CA)*	-	35.000	-	-	-	-	-	-	-	-	0.000	35.000

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 2023	FY 2024
Congressional Add: Program Increase - High Strength Functional Composites ***FY 2023 Accomplishments:*** Congressional Interest Item funding provided for High Strength Functional Composites	5.000	-
Congressional Add: Program Increase: Adaptive Flight Control Technology ***FY 2023 Accomplishments:*** Congressional Interest Item funding provided for Adaptive Flight Control Technology	3.000	-
Congressional Add: Program Increase - DIGITAL TWIN PATHFINDER ***FY 2023 Accomplishments:*** Congressional Interest Item funding provided for Digital Twin Pathfinder	17.000	-
Congressional Add: Program Increase - SEAT TRACK INTEGRATED REPLACEABLE/UPGRADABLE PROTECTION SYSTEM ***FY 2023 Accomplishments:*** Congressional Interest Item funding provided for SEAT TRACK INTEGRATED REPLACEABLE/UPGRADABLE PROTECTION SYSTEM	10.000	-
Congressional Adds Subtotals	35.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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)*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
BZ7: *Future Vertical Lift Medical Technologies*	-	7.496	7.644	7.460	-	7.460	7.452	7.573	7.671	7.750	0.000	53.046

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Medical Standards to Support Future Vertical Lift (FVL)	7.496	7.644	7.460
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 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 (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			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
recommendation package for enhanced FVL crashworthiness. Efforts in this task are further developed in Program Element 060465A, Project CJ5. ***FY 2025 Plans:*** Assess physiologic changes in aviators during cognitive workload. Define the temporal components of an aviator/operator state monitoring system. Determine the efficacy of multisensory cues to maintain optimal flight performance and increase situational awareness under operational stressors. Provide a correlation of HGU-56/P Aircrew Integrated Helmet System damage to head injury. Measure operator response to simulated adaptive automation. Study neurophysiological patterns of spatial disorientation in rotary-wing operations. Conduct a retrospective analysis of injures in accidents involving DoD tilt-rotor and standard rotary wing airframes. Study the effects of 3D auditory cues and automatic noise reduction on aircrew performance. Compare the visual outcomes of different vision improvement surgeries. Efforts in this task are further developed in Program Element 060465A, Project CJ5. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	7.496	7.644	7.460

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CC3: *FVL Radar Technologies*	-	-	-	5.198	-	5.198	3.600	2.100	1.638	1.173	0.000	13.709

Note

FVL Radar Technologies is a new start within the Future Verticle Lift Technology program in FY 2025.

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. Efforts will enable increased platform survivability and lethality in congested/contested MDO environments.

Work in this Project is fully coordinated with Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology), Project CC4 (FVL Radar Advanced Technologies).

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

Work in this Project is performed by Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Airborne Distributed Radar	-	-	5.198
Description: Research and develop distributed radar techniques, including algorithms for Artificial Intelligence (AI)-enabled Automated Target Recognition for distributed airborne radar applications. Conduct monostatic and distributed vulnerability analyses.			
FY 2025 Plans: Will perform a trade study to investigate and inform government and industry of potential problem space contributions through experimentation, studies, and modeling and simulation. Create appropriate documentation and trade studies report to capture findings. Investigate radar waveforms and AI/ML technologies supporting target identification, classification, tracking and prosecution of battlefield threats using radar observations made across distributed platforms. Conduct experiments and laboratory proof-of-concepts to validate initial component designs and concepts.			
FY 2024 to FY 2025 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CC3 / *FVL Radar Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
In FY23 and FY24 this project experiences skip years while CC4 matured and demonstrated earlier investments. In Fiscal Year (FY) 2025 funding is realigned from Program Element (PE) 0603465A (Future Vertical Lift Advanced Technology), Project CC4 (FVL Radar Advanced Technologies), however; this effort is a new start.			
Accomplishments/Planned Programs Subtotals	-	-	5.198

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CH2: *Air Launched Effects Technology*	-	4.065	4.312	2.087	-	2.087	3.390	3.286	-	-	0.000	17.140

Note

Fiscal Year (FY) 2025 a portion of this project is restructured to Program Element 0602183A / Air Platform Applied Research, Project CU9 (Systems Design Technology)

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 Vertical 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), Project AK8 (Air Launched Effects 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.

Work in this Project is performed by Aviation and Missile Center (AvMC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Systems Concepts Studies for Air Launched Effects	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 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 2024 to FY 2025 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
This effort ends in FY24 and funding is realigned to Versatile Air Launched Effects (VALE) Concepts within this project. In Fiscal Year (FY) 2025 a portion of this effort is restructured to Program Element 0602183A / Air Platform Applied Research, Project CU9 (Systems Design Technology).			
Title: Versatile Air Launched Effects (VALE) Concepts ***Description:*** Conducts configuration trades analysis studies and develops technologies that support air and ground launched effects operations in complex, contested environments including urban / fringe and littoral. Matures individual technologies and design concepts that shape investment for Versatile Air Launched Effects Demonstration and inform the System Specifications for the LE Program of Record. ***FY 2025 Plans:*** Will begin exploration of modular air vehicle concepts that incorporate payloads, propulsion, and energy storage for air and ground launched effects operations in long-range littoral and high-maneuverability urban missions. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** This effort begins in FY25 with funding realigned from Systems Concepts Studies for Air Launched Effects within this Project.	-	-	2.087
Accomplishments/Planned Programs Subtotals	4.065	4.312	2.087

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CH3: *Holistic Team Survivability Technology*	-	10.691	11.041	11.066	-	11.066	11.079	11.087	11.132	11.243	0.000	77.339

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) / Project CG1 (Holistic Team Survivability Adv Tech).

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.

Work in this Project is performed by Aviation & Missile Center (AvMC) and Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Advanced Survivability Concepts	3.362	3.464	3.488
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 2024 Plans: 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			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
survivability algorithm development. Will investigate emergent fuel cell vulnerability reduction technologies for next generation FVL platforms. ***FY 2025 Plans:*** Will continue the maturation of RF material for improved durability improvement and weight reduction. Continue to mature and refine algorithms, behaviors, and human machine interface for team-based survivability and begin software in the loop integration. Will continued development and testing of uniquely tailored Electro-Optical/ Infrared coating formulations for FVL and UAS applications. Developed microclimatology algorithms improved survivability situational understanding. Development and maturation of survivability and mission effectiveness modeling and simulation toolsets. Will investigate aviation survivability science and technology concepts and component technologies. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding increase is an economic adjustment.			
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 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 2025 Plans:*** Will develop decision-making algorithms capable of dynamically adapting to changes in threat state and position; assess methods for distributed detection and geolocation of A2/AD threats and quantify improvements in accuracy; model multi-mission EW payload hardware and simulate sensing and effects performance in multi-node configuration. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding increase is an economic adjustment.	7.329	7.577	7.578
Accomplishments/Planned Programs Subtotals	10.691	11.041	11.066

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CH4: *Power & Thermal Management for FVL Tech*	-	7.426	9.766	5.335	-	5.335	5.350	5.316	5.398	5.453	0.000	44.044

Note

In Fiscal Year (FY) 2025 a portion of this Project is restructured to Program Element (PE) 0602183A (Air Platform Applied Research) / Project DK1 (Air Vehicle Integrated & Alternative Tech (AVIATe)).

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), Project CH7 (Power & Thermal Management for FVL Adv Tech).

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.

Work in this Project is performed by Aviation & Missile Center (AvMC) and Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Optimized Energy for C5ISR Platforms	5.058	5.270	5.335
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			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
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 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 2025 Plans:*** Will validate safety of silicon chemistry and enabling components for light weight, high power aviation energy storage systems. Will design and develop a family of thermal management approaches through real world assessment to drive rejection of waste heat generated by platform mission equipment. Will conduct experiment on cold plate designs, novel and engineered phase change materials capable of managing peak thermal loads. Will validate electrical power management strategies and algorithms for vertical lift platforms to efficiently distribute electrical power. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding increase is an economic adjustment.			
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.	2.368	-	-
Title: Adaptive Power Component Technologies ***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 2024 to FY 2025 Increase/Decrease Statement:***	-	2.486	-

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
In FY25 this effort is restructured to Program Element (PE) 0602183A (Air Platform Applied Research) / Project DK1 (Air Vehicle Integrated & Alternative Tech (AVIATe)).			
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 2024 to FY 2025 Increase/Decrease Statement:*** In FY25 this effort is restructured to Program Element (PE) 0602183A (Air Platform Applied Research) / Project DK1 (Air Vehicle Integrated & Alternative Tech (AVIATe)).	-	2.010	-
Accomplishments/Planned Programs Subtotals	7.426	9.766	5.335

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CI4: *Adaptive Avionics Technologies*	-	-	1.005	3.618	-	3.618	3.622	3.625	3.664	3.701	0.000	19.235

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), Project CI8 (Adaptive Avionics Advanced Technologies).

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.

Work in this Project is performed by Aviation & Missile Center (AvMC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Future Avionics Implementation Research (FAIR)	-	1.005	3.618
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 2025 Plans:*** Will continue to conduct trade studies that further explore and narrow technology focuses in support of Adaptive Avionics advanced research activities. The types of research envisioned under these studies may include, but are not limited to, market research, analysis, and experimentation. Conduct engagements with stakeholders to ensure priority alignment and will begin to provide lessons learned from trade studies and market research to respective Adaptive Avionics 6.3 efforts. ***FY 2024 to FY 2025 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602148A / *Future Verticle Lift Technology*	**Project (Number/Name)** CI4 / *Adaptive Avionics Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Funding increase in FY25 reflects further investigations/studies into more specific, specialized, and complex topics that are identified in this effort's FY24 activities and studies.			
Accomplishments/Planned Programs Subtotals	-	1.005	3.618

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CI5: *High Speed Maneuverable Missile (HSMM) Tech*	-	22.607	24.209	-	-	-	0.839	19.191	14.032	4.084	0.000	84.962

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 and ground 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 and ground 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), Project CK2 (High Speed Maneuverable Missile Adv Tech).

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.

Work in this project is performed by Aviation and Missile Center (AvMC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: High Speed Maneuverable Missile (HSMM) Technology	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 2024 Plans: 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 2024 to FY 2025 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
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 2023	FY 2024	FY 2025
In Fiscal Year (FY) 2024 this task for HSMM technology development completes. Maturation and demonstration of component technologies continue in PE 0603465A (Future Vertical Lift Adv Tech), Project CK2 ((High Speed Maneuverable Missile Adv Tech).			
Accomplishments/Planned Programs Subtotals	22.607	24.209	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A