Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force											Date: April 2022	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603456F / *Human Effectiveness Advanced Technology Development*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	29.412	23.459	20.652	0.000	20.652	26.461	33.537	28.876	29.629	Continuing	Continuing
635323: *Directed Energy Bioeffects Parameters*	-	0.000	5.607	5.724	0.000	5.724	9.813	10.632	10.841	11.168	Continuing	Continuing
635324: *Human Dynamics and Terrain Demonstration*	-	10.284	5.651	3.630	0.000	3.630	4.633	9.010	4.297	4.417	Continuing	Continuing
635325: *Mission Effective Performance*	-	19.128	6.722	5.435	0.000	5.435	7.366	9.256	9.160	9.364	Continuing	Continuing
635327: *Warfighter Interfaces*	-	0.000	5.479	5.863	0.000	5.863	4.649	4.639	4.578	4.680	Continuing	Continuing

Note

This program, BA 3, PE 0603456F, project 635324, Human Performance Augmentation and Development, is a new start.

A. Mission Description and Budget Item Justification

This program develops and demonstrates technologies to enhance Airman performance and effectiveness in the aerospace force. State-of-the-science advances are made in warfighter training, warfighter system interfaces, directed energy bioeffects, deployment and sustainment of warfighters in extreme environments, and understanding and shaping adversarial behavior. The Directed Energy Bioeffects Parameters project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. The Human Dynamics and Terrain Demonstration develops, demonstrates, and transitions technologies to sustain airman performance in adverse operational and/or training environments, monitor and mitigate in-flight unexplained physiological events, and prevent human performance related mishaps through real-time monitoring and mitigation—particularly through highly automated or autonomous systems. The Mission Effective Performance project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. The Warfighter Interfaces project develops, demonstrates, and transitions technologies to revolutionize the way airmen synergistically use Air Force systems, including autonomous machines and adaptive teams of airmen and machines. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

The Department of the Air Force technologies in this program are both enabling and enduring as we invest in maturing emerging technologies that address established mission gaps, and transformational technologies that address integrated enterprise capabilities intended to reshape the future force across air, space, and cyber warfighting domains. Development of transformational operational capabilities through advanced technology solutions focuses on five strategic capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, and Mass; and Speed and Reach of Disruption and Lethality.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force	Date: April 2022
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, and 0602298F.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	31.667	24.589	0.000	0.000	0.000
Current President's Budget	29.412	23.459	20.652	0.000	20.652
Total Adjustments	-2.255	-1.130	20.652	0.000	20.652
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	-1.130			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.986	0.000			
• Other Adjustments	-1.269	0.000	20.652	0.000	20.652

Change Summary Explanation

Decrease in FY 2021 reflects reprogramming to support Research and Development Projects, 10 U.S.C. Section 2363, an amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B).

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY2023 cannot be made in a relevant manner.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / *Human Effectiveness Advanced Technology Development*	Project (Number/Name) 635323 / *Directed Energy Bioeffects Parameters*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
635323: *Directed Energy Bioeffects Parameters*	-	0.000	5.607	5.724	0.000	5.724	9.813	10.632	10.841	11.168	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. This project develops the human components of the guidelines for testing, deployment, and protection from high-power microwave and high-energy laser systems and uses this information to enhance the effectiveness of these weapon systems in air, space, and cyber operations. This project develops tools and plug-ins that enhance mission and engagement models, provide predictive risk analysis for deployment of Directed Energy systems, and analyzes systems for use in the Department of Defense. This project develops tools and analysis techniques to model and demonstrate the use of fielded protection on Airman performance, and informs developers of design specifications to optimize design of novel weapon systems.

This project includes the initiation and development of programs addressing Department of the Air Force capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to Department of Air Force design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Transformational Technology Development	0.000	0.958	1.462
Description: Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through the development of new tools and plug-ins that enhance mission and engagement models, and provide predictive risk analysis for deployment of directed energy systems. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635323 / *Directed Energy Bioeffects Parameters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Fund the follow-on efforts for Transformational Technology Development projects selected in prior FYs. Select Transformational Technology Development efforts starting in FY 2022 that support the National Defense Strategy and Department of the Air Force priorities. ***FY 2023 Plans:*** Continue investments leveraging Artificial Intelligence and gaming technologies to accelerate Department of the Air Force capability to create theatre-scale operational plans within hours. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $0.504 million. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.			
Title: Directed Energy Bioeffects ***Description:*** This project combined two efforts into a single effort to better align the directed energy modeling simulation and analysis supporting both radio-frequency and laser bioeffects advanced demonstration. Develop and demonstrate modeling capabilities to assess collateral hazards from high power directed energy laser and radio frequency systems, including the use of probabilistic risk assessment techniques and analysis of system level effects on the Airman. Develop and demonstrate optical protective technologies for aircrew and ground personnel to provide protection against directed energy threats. ***FY 2022 Plans:*** Provide hazard analysis for directed energy systems under development for Department of Defense. Continue maturation of high peak power assessment models and tools to address real world concerns. Provide human response analysis to use of nuclear flash-blindness protection technologies and the impact on mission performance. Continue integration of radio frequency hazard, optical (laser) radiation hazard, and vision analysis and tools into Advanced Framework for Simulation, Integration and Modeling (AFSIM) architecture and the Endgame Framework architecture for future transitions in Joint weaponeering and targeteering tool suites and to support formal studies and analyses. Continue development of Integrated Vision Modeling libraries to inform display design and advanced protection technologies. ***FY 2023 Plans:*** FY 2023 Plans: Continue to provide hazard analysis for directed energy systems under development for the Department of Defense. Continue maturation of high peak power radio frequency and laser assessment models and tools to address real world concerns. Analyze operational & mission performance impacts of ocular personnel protection equipment. Continue integration of radio frequency and optical radiation hazards and vision analysis into engagement-level modeling, simulation, and analysis tools	0.000	4.649	4.262

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635323 / *Directed Energy Bioeffects Parameters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
for future transitions in mission-level tool suites to support formal studies and analyses. Continue development of integrated vision modeling libraries to inform display design and advanced protection technologies. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $0.387 million. Funding decrease due to reduced emphasis on Directed Energy Bioeffects efforts.			
Accomplishments/Planned Programs Subtotals	0.000	5.607	5.724

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / *Human Effectiveness Advanced Technology Development*	Project (Number/Name) 635324 / *Human Dynamics and Terrain Demonstration*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
635324: *Human Dynamics and Terrain Demonstration*	-	10.284	5.651	3.630	0.000	3.630	4.633	9.010	4.297	4.417	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 3, PE 0603456F, project 635324, Human Performance Augmentation and Development, is a new start.

A. Mission Description and Budget Item Justification

Project objective is to develop, demonstrate, and transition products that provide Airman-integrated capabilities to sustain, enhance, and augment airmen physical and cognitive performance under challenging and adverse operational and training mission environments. Integrate technical advances in molecular and synthetic biology, multi-omics, cognitive performance optimization, brain-machine interface, and application of non-invasive physiological and cognitive performance monitoring devices. Develop solutions to sense, assess, and mitigate impacts to airmen performance degradation including, but not limited to, unexplained physiological events (UPE), fatigue, injury, stressors (environmental, occupational, personal), and cognitive overload. Develop technologies to enhance and accelerate individual physical and cognitive ability to rapidly learn and acquire new mission skills and maintain proficiency of acquired skills. Develop technologies providing commanders real time status monitoring and assessment of individual's mission ready status and intervention protocols to accelerate restoral to combat readiness.

This project includes the initiation and development of programs addressing Department of Air Force capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to Department of Air Force design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Transformational Technology Development	0.000	1.232	1.317
Description: Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through unexplained physiological events (UPE), fatigue, injury, stressors (environmental, occupational, personal), and cognitive overload. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635324 / *Human Dynamics and Terrain Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2022 Plans: Fund the follow-on efforts for Transformational Technology Development projects selected in prior FYs. Select Transformational Technology Development efforts starting in FY 2022 that support the National Defense Strategy and Department of the Air Force priorities. ***FY 2023 Plans:*** Continue investments leveraging Artificial Intelligence and gaming technologies to accelerate Department of the Air Force capability to create theatre-scale operational plans within hours. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $0.085 million. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.			
Title: Sensing and Assessment ***Description:*** Develop advanced prototype systems integrating biological, physiological, neural, environmental, and behavioral sensing capabilities with validated analytics and assessments to sustain and enhance Airman performance. Resulting products fall within three operational mission environments: (1) maintenance, (2) special operations/dismount forces, and aircrew (cockpit). Emphasis is on maturing and transitioning wearable and platform integrated technologies that provide operator mission-specific performance sustainment and enhancement. ***FY 2022 Plans:*** Continue to develop, validate, and demonstrate the Integrated Cockpit Sensing technology. Start demonstration effort of a fatigue management system that incorporates self-contained sensing capabilities with validated models of cognitive performance under fatigue to guide targeted intervention. Begin integration of component sensors, models, and intervention protocols/methods into an advanced prototype fatigue management system. Develop models for use in wargaming simulations to assess impact of fatigue on operation effectiveness efficacy of fatigue management technologies. Demonstrates mobile decision-support technologies and software solutions improving situation awareness and enhancing communication effectiveness for dismounted operators. Demonstrate technologies enabling remote monitoring of airman physical and cognitive state. Demonstrate wearable interfaces lessening cognitive demands and increasing sensor interoperability. ***FY 2023 Plans:*** Complete development of the Integrated Cockpit Sensing prototype, conduct operational flight demonstration of the Integrated Cockpit Sensing prototype, and transition Integrated Cockpit Sensing prototype and corresponding data package to transition	10.284	4.419	1.291

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635324 / *Human Dynamics and Terrain Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
partner. Complete prototype development of the baseline Hypothermia Prevention System and conduct operational demonstration of the Hypothermia Prevention System prototype. Foster and maintain a rapid prototype capability to support activities relating to early learning prototyping, product development, and quick turn customer needs. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $3.128 million. Funding decrease due to a reduced emphasis in sensing and assessment efforts, such as capabilities with validated analytics and assessments to sustain and enhance Airman performance.			
Title: Human Performance Augmentation and Development ***Description:*** Develop and demonstrate advanced prototype products that provide Air and Space-integrated capabilities to enhance and enable Airman and warfighter performance under fatigue and other cognitive and physiological stressors beyond current human norms. ***FY 2022 Plans:*** Not applicable ***FY 2023 Plans:*** Initiate advanced product development effort to develop a fatigue management system prototype incorporating integrated sensing capabilities with validated models of cognitive performance under fatigue to guide targeted intervention. Begin planning for start of advanced product effort to develop a biochemical sensor platform utilizing interstitial fluid sensing technologies to analyze operator biomarkers indicative of operational and mission stressors. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $1.022 million. Funding increase due to a added emphasis in a new thrust area for human fatigue, cognitive, and physiological stressors efforts.	0.000	0.000	1.022
Accomplishments/Planned Programs Subtotals	10.284	5.651	3.630

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / *Human Effectiveness Advanced Technology Development*	Project (Number/Name) 635325 / *Mission Effective Performance*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
635325: *Mission Effective Performance*	-	19.128	6.722	5.435	0.000	5.435	7.366	9.256	9.160	9.364	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. This project also develops advanced methods and technologies to enable interactive Live-Virtual-Constructive virtual environments for performance-aiding methods and technologies. Focus areas include integrated high-fidelity weapon systems training technologies for air, space, and cyber; tailored immersive simulation environments for airmen at the tactical and operational levels; and incorporation of performance assessment and feedback tools. These methods and technologies facilitate the development of mission-essential competencies.

This project includes the initiation and development of programs addressing Department of Air Force capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to Department of Air Force design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Transformational Technology Development	0.000	1.643	1.412
Description: Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635325 / *Mission Effective Performance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Fund the follow-on efforts for Transformational Technology Development projects selected in prior FYs. Select Transformational Technology Development efforts starting in FY 2022 that support the National Defense Strategy and Department of the Air Force priorities. ***FY 2023 Plans:*** Continue to develop and enable multi-domain sense-making at the tactical edge. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $0.231 million. Funding decreased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.			
Title: Readiness ***Description:*** Develop and demonstrate secure, persistent, and standardized live, virtual, and constructive training enterprise. Utilize modeling capabilities for technology demonstration efforts focused on developing software-based tools for training that would replace human instructors. ***FY 2022 Plans:*** Continue transition of readiness and proficiency tracking tools into tactical operations. Continue development and evaluation of technologies to permit routine tracking of mission performance and readiness across virtual and live training environments. Complete data specifications for encrypted data retrieval from operational aircraft and instrumented ranges and conduct field demonstrations of seamless, integrated readiness tracking. Begin alignment of augmented and virtual reality training with readiness and proficiency tracking tools. Begin field testing of software agent models inside Government and Commercial training and rehearsal systems and on instrumented ranges. ***FY 2023 Plans:*** Complete proficiency tracking and reporting in Program of Record Mission Training Centers for the F-16, F-15E and Airborne Warning and Control System (AWACS) Block 40/45. Using encrypted data specifications begin migration and integration of those data into an operational readiness data lake with user-specified data extraction and reporting formats. Continue integration of readiness measurement tools in all current training and readiness environments, to include augmented and virtual reality, part-task and full fidelity simulators, and operational range infrastructure. Continue fielding and conduct evaluations of higher fidelity software agent models integrated with live and virtual systems and their impact on the quality of training and exercise for a peer fight. Begin work to integrate technologies to support multi-capable airmen with just-in-time-training and readiness support in deployed and austere mission contexts and locations. Begin work to connect developed data lake and proficiency infrastructure	19.128	5.079	4.023

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635325 / *Mission Effective Performance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
with operational event-based tracking and reporting systems. Begin systematic evaluations of proficiency-based live, virtual, and constructive (LVC) on operational readiness and more optimal mixes of live and virtual training and exercise. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $1.056 million. Funding decrease due to reduced emphasis in efforts such as live and virtual training and exercise, and integration of readiness measurement tools in all current training and readiness environments.			
Accomplishments/Planned Programs Subtotals	19.128	6.722	5.435

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / *Human Effectiveness Advanced Technology Development*	Project (Number/Name) 635327 / *Warfighter Interfaces*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
635327: *Warfighter Interfaces*	-	0.000	5.479	5.863	0.000	5.863	4.649	4.639	4.578	4.680	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops, demonstrates, and readies the transition of technologies to revolutionize the way airmen optimize the capabilities of Air Force systems, including autonomous machines and adaptive teams of Airmen and machines. Improvements in the presentation of operational information to the community of users, from the system operator to the commander, must be developed in step with advancements in the acquisition, storage, and retrieval of information. This project provides the advances in understanding of human cognitive abilities, as well as the utilization of human interfaces, multisensory fusion, high-resolution image displays, and three-dimensional audio to customize communications and enhance shared understanding across a diverse user community in air, space, and cyber for maximum situational awareness.

This project includes the initiation and development of programs addressing Department of Air Force capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to Department of Air Force design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Transformational Technology Development	0.000	0.685	1.021
Description: Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through autonomous machines and adaptive teams of Airmen and machines. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.			
FY 2022 Plans: Fund the follow-on efforts for Transformational Technology Development projects selected in prior FYs. Select Transformational Technology Development efforts starting in FY 2022 that support the National Defense Strategy and Department of the Air Force priorities.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635327 / *Warfighter Interfaces*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Continue investments leveraging Artificial Intelligence and gaming technologies to accelerate Department of the Air Force capability to create theatre-scale operational plans within hours. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $0.336 million. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.			
Title: Airman Machine Interfaces ***Description:*** Description: Develops advanced, situationally-adaptive and scalable interface technology and decision aiding tools for more rapid and accurate battlefield awareness, decision making and maximized collaborative, distributed human-machine team performance. This is accomplished through integrated solutions that manage Airman and Guardian cognitive workload in complex, distributed, and degraded environments. ***FY 2022 Plans:*** Prepare for transition of advanced command and control technologies for operators in multiple domains operating in both the air and ground. Develop and demonstrate manned-unmanned teaming interfaces with intents and concepts embedded within the strategic, operational and tactical environments. Continue development of collaborative interfaces for cognitive workload reduction. Establish online repositories for open and interoperable software development. Prototype operational human-machine interfaces via dismounted/mounted hardware. Develop and transition interface technologies to satisfy user requirements by controlling the tactical airspace inhabited by small unmanned aerial systems. ***FY 2023 Plans:*** Continue to transition advanced command and control (C2) technologies for operators in multiple domains, as well as enabling Air Battle Management System capabilities for distributed C2. Continue to build library of user interfaces for manned-unmanned teaming in order to meet demands of strategic, operational and tactical environments. Continue development of collaborative interfaces, leveraging intelligent agents, for cognitive workload reduction. Transition open and interoperable software to Air Battle Management System-supported platforms. Transition interface technologies for base defense and protection of the tactical airspace from small unmanned aerial systems. Develop wearable communication management platform prototype for mission recording and intelligibility enhancement. Automate mission planning and debrief for assets with unique capabilities and enhance with intelligent agent aided decision making. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	0.000	1.678	1.694

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635327 / *Warfighter Interfaces*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2023 increased compared to FY 2022 by $0.016 million. Funding increase due to added emphasis in airman-machine interface efforts.			
Title: Analytic Tools	0.000	3.116	3.148
Description: Develop, demonstrate, and transition software and hardware tools that help Conventional Department of Defense, Special Operations, and Intelligence customers to rapidly identify, analyze, shape, and operationalize all types of information without succumbing to "analysis paralysis." In addition to delivering stand-alone tools, supports other Air Force Research Laboratory Technical Directorates. Build human-centric solutions to: triage data-at-scale, automate mundane processes, optimize workflow, identify obscured patterns, mitigate cognitive overload, expedite logical decision-making, quantify performance metrics, accelerate human interpretation of information, and autonomously cue humans in real and simulated environments. These tools mitigate the scale and complexity imposed by Great Power Competition in Joint All Domain Operations environments. ***FY 2022 Plans:*** Perform integration and transition of speech-to-text technologies with military intelligence systems. Enhance electronic, air, and air defense order of battle visualization, analysis, and dissemination to multiple theaters of operation. Enhance threat detection, decision making, and intelligence, surveillance and reconnaissance planning and collection decision aides. Prepare for Department of the Air Force certification and transition of technology solutions to strategic partners. Conduct research to speed up access to the relevance of auto-detections of vital data. Timeliness of detection will continue to improve warfighter decision making. Research and document detections via several methods of automation and deliver concepts of operation (CONOPS) and tactics, techniques and procedures (TTPs) for tactical use of national exploitation systems, with characterizations of denied weapons systems. Perform evaluations of automation methods for new systems, not typically used for algorithm detections. ***FY 2023 Plans:*** Build upon existing, in-house Live-Virtual-Constructive simulation architecture to address training deficiencies across the United States Air Force. Automate the following: post-training grading in single simulator environment, real-time feedback in single simulator environment, proactive cueing in single simulator environment, real-time feedback and proactive cueing in multi-simulator, team environment. Expand upon existing, in-house Live-Virtual-Constructive simulation architecture to include the Space, Cyber, and/or Maritime domains to support the emerging focus on the Great Power Competition, and Joint All Domain Operations environment. Productize a suite of customized software developed to operationalize existing, in-house Live-Virtual-Constructive architecture. Evolve new and/or existing Artificial Intelligence/Machine Learning analytic tools from "canned" frameworks to explainable architectures and interfaces that leverage the psychology of human trust. ***FY 2022 to FY 2023 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603456F / *Human Effectiveness Advanced Technology Development*	**Project (Number/Name)** 635327 / *Warfighter Interfaces*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2023 increased compared to FY 2022 by $0.032 million. Funding increase due to reduced emphasis in Artificial Intelligence/ Machine Learning analytic tools, and live-virtual-constructive efforts.			
Accomplishments/Planned Programs Subtotals	0.000	5.479	5.863

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable