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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force **Date:** May 2021

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	32.827	31.667	24.589	0.000	24.589	-	-	-	-	-	-
635323: <i>Directed Energy Bioeffects Parameters</i>	-	5.154	0.000	5.847	0.000	5.847	-	-	-	-	-	-
635324: <i>Human Dynamics and Terrain Demonstration</i>	-	5.886	10.777	5.959	0.000	5.959	-	-	-	-	-	-
635325: <i>Mission Effective Performance</i>	-	6.930	20.890	7.133	0.000	7.133	-	-	-	-	-	-
635327: <i>Warfighter Interfaces</i>	-	14.857	0.000	5.650	0.000	5.650	-	-	-	-	-	-

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.

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 PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>
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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	37.542	0.000	0.000	0.000	0.000
Current President's Budget	32.827	31.667	24.589	0.000	24.589
Total Adjustments	-4.715	31.667	24.589	0.000	24.589
• Congressional General Reductions	0.000	-0.058			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	31.725			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.168	0.000			
• Other Adjustments	-3.547	0.000	24.589	0.000	24.589

Change Summary Explanation

FY 2021 and FY 2022: Congressional directed realignments from program element restructure.

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				Project (Number/Name) 635323 / <i>Directed Energy Bioeffects Parameters</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635323: <i>Directed Energy Bioeffects Parameters</i>	-	5.154	0.000	5.847	0.000	5.847	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	0.000	0.000	1.198
Description: Continually funded effort. This funding allocation is to provide funding to start new and continue Transformational Technology Developments. 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 predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities 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 2021 Plans: Not applicable. This effort is starting in FY 2022.			
FY 2022 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635323 / <i>Directed Energy Bioeffects Parameters</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$1.198 million. Funding is increased due to initiation of this effort to increased emphasis in Transformational Technology Development projects.				
Title: Directed Energy Bioeffects		0.000	0.000	4.649
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 (optical) bioeffects advanced demonstration. Develop and demonstrate modeling capabilities to assess collateral hazards from high power directed energy laser and radio frequency (RF) 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 2021 Plans: Provide hazard analysis for High Energy Laser flight safety reports. Readdress safety analysis for advancing Department of Defense directed energy concepts for safety review and technical review boards. Continue development of high peak power assessment models and tools to address real world concerns. Conclude evaluation of next generation of nuclear flash-blindness technologies and the impact on mission performance. Continue integration of radio frequency hazard, optical 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. Begin development of Integrated Vision Modeling libraries to inform display design and advance protection technologies.				
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 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 2021 to FY 2022 Increase/Decrease Statement:				

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635323 / <i>Directed Energy Bioeffects Parameters</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021 by \$4.649 million. Funding increase due to added emphasis on Directed Energy Bioeffects efforts.				
<p>Title: Optical Radiation Bioeffects</p> <p>Description: Develop and demonstrate optical protective technologies for aircrew and ground personnel to provide protection against directed energy threats. Develop modeling capabilities to assess collateral hazards from high-power directed energy laser systems.</p> <p>FY 2021 Plans: In FY 2021, this work is performed under the Directed Energy Bioeffects effort.</p> <p>FY 2022 Plans: Not applicable</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable</p>		4.169	0.000	0.000
<p>Title: Radio Frequency Bioeffects</p> <p>Description: Develop and demonstrate technologies to assess radio frequency (RF) bioeffects and collateral hazards from high-power RF directed energy systems.</p> <p>FY 2021 Plans: In FY 2021, this work is performed under the Directed Energy Bioeffects effort.</p> <p>FY 2022 Plans: Not applicable</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable</p>		0.985	0.000	0.000
Accomplishments/Planned Programs Subtotals		5.154	0.000	5.847
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635323 / <i>Directed Energy Bioeffects Parameters</i>

D. Acquisition Strategy

Not applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				Project (Number/Name) 635324 / <i>Human Dynamics and Terrain Demonstration</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635324: <i>Human Dynamics and Terrain Demonstration</i>	-	5.886	10.777	5.959	0.000	5.959	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	0.000	0.000	1.540
Description: Continually funded effort. This funding allocation is to provide funding to start new and continue Transformational Technology Developments. 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: 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.			
FY 2021 Plans: Not Applicable			
FY 2022 Plans:			

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635324 / <i>Human Dynamics and Terrain Demonstration</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$1.540 million. Funding is increased due to initiation of this effort to increased emphasis in Transformational Technology Development projects.				
Title: Sensing and Assessment Description: This project combined two efforts into a single effort to better align product development. Develop products that integrate biological, physiological, neural, environmental, and behavioral sensing capabilities with validated analytics and assessments to sustain and enhance airman performance in adverse operational and/or training environments. FY 2021 Plans: Initiate Integrated Cockpit Sensing effort to develop validated sensor suite providing real-time pilot alerting and data storage for unexplained physiological event root cause analysis. Perform sensor component down select following laboratory environmental (altitude chamber, centrifuge) testing. Conduct sensor component flight demonstrations in T-6 and F-16. Conduct ground-based demonstration of prototype integrated capability in F-35 simulation and simulator-based training exercises. 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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$6.358 million. Funding decrease due to a reduced emphasis in sensing and assessment efforts.		0.000	10.777	4.419
Title: Human Analyst Augmentation Description: Develop and demonstrate human-centered design processes and operational tools that optimize Intelligence, Surveillance and Reconnaissance information exploitation and analysis.		4.104	0.000	0.000

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635324 / <i>Human Dynamics and Terrain Demonstration</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
<p>FY 2021 Plans: In FY 2021, this work is performed under the Sensing and Assessment effort.</p> <p>FY 2022 Plans: Not applicable</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable</p>				
<p>Title: Human Trust and Interaction</p> <p>Description: Develop and demonstrate machine translation and speech-to-text tools to support the span of Air Force mission areas including intelligence, surveillance, and reconnaissance and cyber operations.</p> <p>FY 2021 Plans: In FY 2021, this work is performed under the Sensing and Assessment effort.</p> <p>FY 2022 Plans: Not applicable</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable</p>		1.782	0.000	0.000
Accomplishments/Planned Programs Subtotals		5.886	10.777	5.959
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
Not applicable				

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				Project (Number/Name) 635325 / <i>Mission Effective Performance</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635325: <i>Mission Effective Performance</i>	-	6.930	20.890	7.133	0.000	7.133	-	-	-	-	-	-
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, and constructive (LVC) 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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	0.000	0.000	2.054
Description: Continually funded effort. This funding allocation is to provide funding to start new and continue Transformational Technology Developments. 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: 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 2021 Plans: Not Applicable			
FY 2022 Plans:			

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635325 / <i>Mission Effective Performance</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$2.054 million. Funding is increased due to initiation of this effort to increased emphasis in Transformational Technology Development projects.				
Title: Readiness		0.000	20.890	5.079
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 2021 Plans: Complete initial development of proficiency-based training metrics and assessments in operational contexts. Continue multidomain operations training development and demonstration. Continue field evaluations for performance-based after action review visualization tools in unit-level and Red Flag-Level training and rehearsal. Continue assessments and evaluations of common range and simulation architecture technologies for Live, Virtual, and Constructive training capabilities. Complete portfolio migration focused on advanced research and transitions under a Readiness product line construct with emphases on standards for training and operational data, tools for rapid development of mission-focused software agent applications. Continue to develop realistic in contested degraded operations environment multi- domain operations training and rehearsal.				
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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by 15.811 million. Funding decrease due to reduced emphasis in readiness efforts.				
Title: Continuous Learning		6.930	0.000	0.000

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635325 / <i>Mission Effective Performance</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
<p>Description: Develop and demonstrate secure, persistent, and standardized LVC training enterprise. Utilize modeling capabilities for technology demonstration efforts focused on developing software-based tools for training that would replace human instructors.</p> <p>FY 2021 Plans: In FY 2021, this work is performed under the Readiness effort.</p> <p>FY 2022 Plans: Not applicable</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable</p>			
Accomplishments/Planned Programs Subtotals	6.930	20.890	7.133

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635327: Warfighter Interfaces	-	14.857	0.000	5.650	0.000	5.650	-	-	-	-	-	-
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 (3D) 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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	0.000	0.000	0.856
<p>Description: Continually funded effort. This funding allocation is to provide funding to start new and continue Transformational Technology Developments. 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: 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.</p>			
<p>FY 2021 Plans: Not Applicable</p>			
<p>FY 2022 Plans:</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$0.856 million. Funding is increased due to initiation of this effort to increased emphasis in Transformational Technology Development projects.				
Title: Airman Machine Interfaces Description: Develops and demonstrates wearable technologies and operator-centric interfaces that increase the Airman's combat capabilities. This is accomplished through integrated solutions that develop synergies, maximize battlespace interoperability, and increase combat power while decreasing Airman physical and cognitive workloads. FY 2021 Plans: In FY 2021, prepare for transition of advanced wearable technologies improving situation awareness and enhancing communication effectiveness for dismounted operators. Develop and demonstrate manned-unmanned pilot vehicle interface mission intents and team concepts for tactical environments. Develop team collaborative interfaces focusing on cognitive workload reduction. Prototype innovative man-wearable interfaces tailored to Special Warfare operations. 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 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$1.678 million. Funding increase due to added emphasis in airman-machine interface efforts.		0.000	0.000	1.678
Title: Analytic Tools Description: Develops, demonstrates, and matures software solutions for Command and Control, Intelligence Surveillance & Reconnaissance, Space, and Cyber customers for improved system performance (operator/analyst and software). Software ranges from simplistic decision support systems to sophisticated artificial intelligence and machine learning algorithms designed to handle data at the scale of operations. Heavy emphasis is placed on human-machine teaming including workflow design and		0.000	0.000	3.116

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635327 / <i>Warfighter Interfaces</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
<p>integration of both automated and human-generated results. Effort leverages significant infrastructure in big-data design and capture, allowing for rapid prototyping of capabilities directly to web-based platforms on classified environments. Program directly supports contested-denied operations in a multi-domain environment.</p> <p>FY 2021 Plans: In FY 2021, prepare to transition speech-to-text technologies for military intelligence producing systems. Enhance and prepare for transition Electronic Order of Battle tools for multiple theaters of operation. Test and host open source speech-to-text methods on multiple networks. Enhance automated speed of detections for national imagery exploitation. Perform technical demonstrations at exercises supporting United States Pacific Command and United States European Command.</p> <p>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 (ISR) 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.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$3.116 million. Funding increased due to added emphasis analytic tools efforts.</p>				
<p>Title: Battlespace Acoustics</p> <p>Description: Develops and demonstrates wearable technologies and operator-centric interfaces that increase the Airman's combat capabilities. This is accomplished through integrated solutions that develop synergies, maximize battlespace interoperability, and increase combat power while decreasing Airman physical and cognitive workloads.</p> <p>FY 2021 Plans: In FY 2021, this work is performed under the Airman Machine Interfaces effort, with the exception of funding associated with the Skyborg Vanguard demonstration which is performed under the Skyborg effort in PE 0603032F, Future AF Integrated Tech Demos, Project 630320, Air Force Vanguard.</p> <p>FY 2022 Plans:</p>		3.714	0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	Project (Number/Name) 635327 / <i>Warfighter Interfaces</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
Not applicable				
FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable				
Title: Human Role in Semiautonomous Systems		11.143	0.000	0.000
Description: Develops, demonstrates, and matures software solutions for Command and Control, Intelligence Surveillance & Reconnaissance, Space, and Cyber customers for improved system performance (operator/analyst and software). Software ranges from simplistic decision support systems to sophisticated artificial intelligence and machine learning algorithms designed to handle data at the scale of operations. Heavy emphasis is placed on human-machine teaming including workflow design and integration of both automated and human-generated results. Effort leverages significant infrastructure in big-data design and capture, allowing for rapid prototyping of capabilities directly to web-based platforms on classified environments. Program directly supports contested-denied operations in a multi-domain environment.				
FY 2021 Plans: In FY 2021, this work is performed under the Analytic Tools effort, with the exception of funding associated with the Skyborg Vanguard demonstration which is performed under the Skyborg effort in PE 0603032F, Future AF Integrated Tech Demos, Project 630320, Air Force Vanguards.				
FY 2022 Plans: Not applicable				
FY 2021 to FY 2022 Increase/Decrease Statement: Not applicable				
Accomplishments/Planned Programs Subtotals		14.857	0.000	5.650
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
Not applicable				