Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force												Date: March 2023
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603032F / *Future AF Integrated Technology Demos*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	103.886	163.887	255.855	0.000	255.855	270.984	300.704	299.982	310.993	Continuing	Continuing
630320: *Air Force Vanguards*	-	103.886	163.887	255.855	0.000	255.855	270.984	300.704	299.982	310.993	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program uses a deliberate, data-driven strategy-to-investment approach to develop and deliver transformational operational capabilities through advanced technology solutions. These capabilities focus on the DAF Operational Imperatives and 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.

A multi-disciplinary WARfighter - TECHnologist (WARTECH) process and analytics are used to understand and validate Department of the Air Force (DAF) Future Force priorities. Teams examine emerging technologies and recommend those which could produce new transformational capabilities. This approach allows the DAF to rapidly respond to emerging S&T opportunities within the budget cycle.

Technologies needing concept refinement become Vanguard Pathfinders to better define capability concepts. Current Vanguard Pathfinders are Integrated Electronic Warfare, Integrated Networks, Advanced Emulation for Test and Training, and Enabling Technology for Agile Basing.

Promising technologies with defined concepts are accelerated and matured as Vanguard Prospects. The DAF Technology Executive Officer partners with Air Force Futures (A5/7), USSF (CTIO, USSF/S5B), and the Deputy Assistant Secretary (Science, Technology and Engineering) to identify these technologies. Current Vanguard Prospects are Resolute Sentry, Fight Tonight, Long Range Kill Chains, and Area Effects Demonstration.

Matured technologies evolve into integrated system-of-systems concepts with transition partners and fielding strategies, known as Vanguard Programs. Vanguard Programs - high risk by design - are focused, priority initiatives with enterprise commitment aiming to answer specific questions to inform future acquisition programs, identify gaps, and areas for additional research. They are commissioned by the Under Secretary of the Air Force, Vice Chief of Staff of the Air Force, and Vice Chief of Space Operations as a Department of the Air Force (DAF).

The current Vanguard Programs are Navigation Technology Satellite 3 (NTS-3) and Rocket Cargo. NTS-3 will demonstrate technologies and tactics involving space, control, and user equipment for advanced satellite navigation, in order to provide robust and resilient, agile augmentation to the GPS system. Rocket Cargo will demonstrate new trajectories and ways to fly large rockets, the ability to land rockets at austere locations, and design & test an ejectable pod for air drop.

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.

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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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	112.643	152.559	56.819	0.000	56.819
Current President's Budget	103.886	163.887	255.855	0.000	255.855
Total Adjustments	-8.757	11.328	199.036	0.000	199.036
• Congressional General Reductions	0.000	-90.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	5.000			
• Congressional Directed Transfers	0.000	96.990			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-8.757	0.000			
• Other Adjustments	0.000	-0.662	199.036	0.000	199.036

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 630320: *Air Force Vanguards*		
Congressional Add: *Program increase - automated geospatial intelligence detection algorithms*	0.000	5.000
Congressional Add Subtotals for Project: 630320	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

In FY 2023 and beyond, Program Element (PE) 0603032 Future AF Integrated Technology Demos, Project 630320 Air Force Vanguards, increases due to the realignment of Transformational Technology Development Efforts from 11 Budget Activity 03 Programs into this Program. This activity is not a new start as it is realigning from previously justified PEs. The following PE/ Projects are impacted: PE 0603112 Advanced Materials for Weapons Systems, Projects 633153 Non-Destructive Inspection Development and 633946 Materials Transition; PE 0603199 Sustainment Science and Technology, Project 635351 Technology Sustainment; PE 0603203 Advanced Aerospace Sensors, Projects 63665A Advanced Aerospace Sensors and Technology and 6369DF Target Attack and Recognition Technology; PE 0603211 Aerospace Technology Dev/Demo, Projects 634920 Flight Vehicle Tech Integration and 634927 Flight Systems Control; PE 0603216 Aerospace Propulsion & Power Technology, Projects 633035 Aerospace Power Technology, 634093 Missile Rocket Propulsion Integration and Demo, 634921 Aircraft Propulsion Subsystems Int; PE 0603270 Electronic Combat Technology, Projects 633720 EW Quick Reaction Capabilities, 63431G RF Warning & Countermeasures Technology, 634335 Cyber Concepts, 63691X EO/IR Warning & Countermeasures Technology; PE 0603456 Human Effectiveness Advanced Technology Development, Projects 635323 Directed Energy Bioeffects Parameters, 635324 Human Dynamics and Terrain Demonstration, 635325 Mission Effective Performance, 635327 Warfighter Interfaces; PE 0603601 Conventional Weapons Technology, Project 63670B Weapon Concept Development;

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PE 0603605 Advanced Weapons Technology, Projects 633151 High Power Solid State Laser Technology, 633152 High Power Microwave Development and Integration; PE 0603788 Battlespace Knowledge Development & Demonstration, Projects 635321 C4I Battlespace Dev & Demo 635329 Cyber Battlespace Dev & Demo. Increase also represents increased emphasis on incubating the next generation of Vanguard Programs through the newly-described Vanguard Pathfinder efforts in this program. Pathfinder efforts represent technology maturation and risk reduction efforts in support of strategically-aligned topics intended to develop into future Vanguard candidates.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: WARTECH	8.358	1.880	21.108

Description: The Department of the Air Force needs to provide game-changing leap-ahead capabilities to meet future force designs. This effort identifies transformational science and technology investment opportunities through the WARfighter-TECHnologist (WARTECH) process. The WARTECH process enables the DAF enterprise to collaboratively translate future force design priorities and requirements into targeted multi-disciplinary science and technology investments.

WARTECH accelerates capability development and responds to emerging technology opportunities by supporting integrated concept exploration. These investments support activities such as mission thread analyses to demonstrate military utility and software and hardware feasibility assessments. Select efforts will evolve into either a Vanguard Pathfinder to allow for further assessment and maturation or be designated a Vanguard Prospect indicating enterprise-level priority.

FY 2023 Plans:
Continue investments that address DAF priorities such as achieving operationally optimized command and control, achieving target engagement at scale, and defining optimized resilient basing, sustainment, and communications. 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 2024 Plans:
Initiate activities to mature and demonstrate advanced technology solutions, components and sub-system prototypes and models to accomplish successful large-scale widely distributed all-domain warfighter operations. Initiate activities to explore technologies that support achieving all-domain moving target engagement at scale in challenging operational environments. Continue activities exploring sensing technologies, investigating algorithm development to support battle management and command and control solutions, exploring alternative position navigation and timing techniques, supporting next generation air refueling, and exploring technology development and production of low-cost and high-speed weapons. Continue activities exploring technologies supporting offensive and defensive capabilities.

FY 2023 to FY 2024 Increase/Decrease Statement:

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2024 funding increased compared to FY 2023 by $19.228 million. This increase represents an increased emphasis on activities supporting sensing technologies, algorithm development to support battle management, command and control solutions, alternative position, navigation, and timing techniques, and low-cost, high-speed weapons.			
Title: Navigation Technology Satellite 3 (NTS-3) ***Description:*** Develop and demonstrate advanced space-based navigation system technologies to provide resilient navigation support in contested environments. The demonstration includes a space-based test vehicle, ground based enterprise command and control, and agile software defined receivers for the user. ***FY 2023 Plans:*** Complete experimental operations training and rehearsals. Complete all experiment plans and finalize experimental procedures and 1-year on-orbit experiment schedule. Complete final user equipment software release and deploy all receivers to CONUS sites to support experimental data collection. Initiate support of pre-launch activities such as delivering certifications of flight readiness, shipping fully integrated and tested spacecraft to launch site, and supporting launch activities. Prepare for transition to follow-on residual operations. ***FY 2024 Plans:*** Continue supporting pre-launch activities. Initiate launch of satellite and perform early orbit operations. Initiate on-orbit experimentation. Initiate simulated operational test events through both receivers in the field and on-orbit transmitted signals. Initiate completion of mission objectives. Continue supporting transition of the overall system for conduct of residual use activities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $5.562 million. Funding decreased due to completing test & spacecraft integration and ground control system deployment to mission operations control site, completing final integrated system tests, completing experimental operations training and rehearsals, and launch integration.	14.858	10.735	5.173
Title: Skyborg ***Description:*** Skyborg is an autonomous, attritable vehicle architecture suite which will enable the Air Force to posture, produce and sustain multi-mission sorties at sufficient tempo to thwart adversary attempts at quick, decisive action in contested and highly contested environments. Skyborg is organized into three main lines of effort (LOEs). LOE 1 develops, demonstrates, and prototypes the Autonomy Core System (ACS) consisting of Skyborg autonomy architecture and software, enabling machine and manned-unmanned teaming, while also ensuring openness, modularity, and expandability of the Skyborg autonomy mission systems suite. The ACS LOE also develops, demonstrates, and prototypes the hardware components and Open Architecture standards needed to allow modular sensor, communication, and other payload integration into the Skyborg autonomy and vehicle architectures in systems integration laboratories and platforms. LOE 2 (Low-cost vehicles) develops, demonstrates,	54.017	46.680	0.000

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
and prototypes new low cost attritable vehicle concepts and technologies for expeditionary mass generation including sortie generation employment concepts. LOE 3 (Operational Experimentation) conducts analysis and experimentation on concepts of operations and concepts of employment for attritable, autonomous, unmanned systems and assesses the openness, and modular capabilities / sensors integration for autonomous, attritable, aircraft and mission systems. ***FY 2023 Plans:*** Complete development, demonstration, and transition of Skyborg Autonomy Core System hardware and software open architecture and components. Complete maturation and transition of human systems interfaces for autonomous systems. Complete demonstration and transition of government open architectures for autonomous unmanned systems. Complete demonstration and transition of a DevSecOps pipeline for the Skyborg Autonomy Core system software architecture. Complete creation and start-up of a digital integration facility including a system integration laboratory, digital engineering modeling, simulation and analysis laboratory and hardware/software-in-the-loop test facility for transition of Skyborg technology to program customers. ***FY 2024 Plans:*** Skyborg technology transitioned to USAF Program of Record. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $46.680 million. Funding decreased due to S&T program transitioning to an acquisition program.			
Title: Golden Horde ***Description:*** Integrate networked collaborative technologies into selected inventory weapon systems. Technologies can include new payloads, weapon datalinks/radios, and autonomous behaviors that are bounded by operator-defined mission rules of engagement. Supports the integration of Air Force weapons into the Joint All-Domain Command/Control network. Develop new standard software and hardware architecture environment to accelerate change for new weapon systems. This environment will integrate new concept designs via simulations, virtual and live testing, and operational analysis, experiments and war games to show the value of collaborative weapons in increasing combat power across the spectrum of conflict. Work with Weapons Program Executive Officer to define requirements for future weapons and Concept of Operations. ***FY 2023 Plans:*** Complete development of the multi-tier digital weapon ecosystem, consisting of a high fidelity, government owned, open architected, live, virtual, and constructive development pipeline for Networked Collaborative and Autonomous (NCA) technology and tactics. Complete the Software Integration and Simulation Laboratory. Complete the hardware-in-the-loop environment. Complete conducting yearly challenges where both traditional and non-traditional suppliers can compete new NCA weapon	0.000	18.812	0.000

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
technology using Government reference architectures to accelerate delivery and verification of new weapon technology. Complete building the repository of industry NCA weapon technology and containerized NCA algorithms/software to have off-the-shelf solutions for new weapon development programs. Initiate and complete demonstration of UAS surrogate capability to conduct high fidelity live constructive testing of NCA technology with a mix of live and simulated vehicles. Complete transition of the ecosystem to potential users/partners. ***FY 2024 Plans:*** Golden Horde multi-tier digital weapon ecosystem transition to Weapons Program Executive Officer. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $18.812 million. Funding decreased due to S&T program transitioning to Weapons Program Executive Officer.			
Title: Rocket Cargo	26.653	28.900	42.200
Description: Rocket Cargo is an S&T effort to leverage the multi-billion dollars of commercial investments in large reusable launch vehicles to extend the commercial rocket capabilities and create a novel DOD solution for global reach. DAF S&T efforts and resources are focused on the specific areas that are unique to military transport applications. The S&T objective is to determine the viability, performance, military utility, and business case of the commercial rocket capability. Potential investigation activities will include detailed mission & cost analyses, investigation of the harsh rocket plume interactions with landing surfaces, evaluation of rocket landing capabilities at austere sites, and human factors at landing sites. Investments will also determine the ability to airdrop cargo after reentry, will assess in-flight communications to the rocket, will test cargo environments and novel cargo "loadmaster" designs for rapid load/unload, and will evaluate rocket detectability and vulnerability. ***FY 2023 Plans:*** Continue multi-disciplinary S&T to expand commercial rocket capabilities for DOD global cargo delivery on tactical timelines. Continue investigations of rocket landing viability over a broader range of unprepared sites and non-standard landing surfaces relevant to rocket delivery directly to the point of need, including landing pad material surface degradation and human factors at the landing site. Complete initial rocket plume degradation assessments for high-temperature concrete at landing sites. Complete landing acoustic experiments and update DAF computational fluid dynamic (CFD) models. Initiate leveraging commercial full-scale rocket engine tests on concrete and other terrains to update computational simulations and predict landing surface degradation for DOD operations. Continue airdrop S&T on container freefall aerodynamics and stability through wind tunnel experiments to anchor CFD models. Complete wind tunnel experiments for rocket landing aerodynamics to support heavy landing maneuvers. Continue to leverage commercial rocket ground testing and commercial rocket flights to determine rocket cargo environments and performance, specifically to including 2nd stage rocket reentry and landing maneuvers that are unique to rocket delivery of 30 to 100 tons cargo. Complete assessment of rocket landing G-loads and compared to DOD standards for			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
air transport to guide container development S&T. Complete review of cargo payloads and cargo interfaces for heavy landing demonstration. Complete FFRDC analysis of mission applications and CONOPS for a specific use case. Continue quantitative S&T assessment of the rocket detectability and vulnerability, anchored with rocket flight data, to determine implications for military missions; incorporate these details into detailed mission analysis and the capability return on investment. Complete analysis of rocket vulnerability based on predicted flight trajectories. Complete assessment of detectability based on predicted flight trajectories and field-test campaigns. Continue development of mission planning tools for tactical cargo delivery timelines. ***FY 2024 Plans:*** Continue multi-disciplinary S&T to expand commercial rocket capabilities for DOD global cargo delivery on tactical timelines. Continue investigations of rocket landing viability over a broader range of unprepared sites and non-standard landing surfaces relevant to rocket delivery directly to the point of need, including landing pad material surface degradation and human factors at the landing site. Continue to leverage commercial full-scale rocket engine tests on concrete and other terrains to update computational simulations and predict landing surface degradation for DOD operations. Complete airdrop S&T on container freefall aerodynamics and stability through wind tunnel experiments to anchor computational fluid dynamics (CFD) models. Initiate new airdrop S&T on the high-speed separation physics for airdrop payload ejection from the rocket, including new wind tunnel capabilities. Continue to leverage commercial rocket ground testing and commercial rocket flights to determine rocket cargo environments and performance, specifically to including 2nd stage rocket reentry and landing maneuvers that are unique to rocket delivery of 30 to 100 tons cargo. Initiate new design tasks for a scheduled FY25 demonstration launch to transport 30 to 100 tons of cargo to an austere site. Initiate experiments of in-flight communications to the rocket during all phases of flight, including hypersonic reentry. Continue quantitative S&T assessment of the rocket detectability and vulnerability, anchored with rocket flight data, to determine implications for military missions; incorporate these details into detailed mission analysis and the capability return on investment. Continue development of mission planning tools for tactical cargo delivery timelines. Initiate testing of rapid cargo load/unload capabilities with DOD partners and optimize these for tactical timelines and the DOD logistics mission set. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $13.3 million. This funding increase is due to the scheduled ramp-up of several critical tasks on rocket CONOPS to begin preparations for a scheduled FY25 demonstration launch, initiation of new airdrop S&T on the high-speed separation physics for airdrop payload ejection from the rocket in wind tunnels, assessments of in-flight communications to the rocket during all phases of flight, and testing of rapid load/unload capabilities.			
Title: Vanguard Prospect - Resolute Sentry	0.000	14.958	30.325
Description: Provides real-time multi-domain battlespace awareness in highly contested environments. Develops and demonstrates autonomous cross-domain, cross-platform integrated software and hardware capabilities that enable Intelligence, Surveillance, and Reconnaissance in unmanned airborne systems at the tactical edge in communications degraded and denied			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
environments. Resolute Sentry fuses information from multiple sources with on-board and local sensors to provide higher fidelity battlespace awareness information to the joint force as part of the Sensing Grid feed to the Joint All Domain Command and Control capability. Resolute Sentry leverages Open Mission Systems and Sensor Open Systems Architectures to maximize platform compatibility. ***FY 2023 Plans:*** Continue open systems assessments, development, maturation, integration, and testing of advanced sensor fusion, robust communications, and platform orchestration technologies integrated with advanced computing hardware for autonomous unmanned systems at the tactical edge. Continue modeling, simulation, and analysis of system design trades and Model Based System Engineering activities for the air domain. Continue air domain analyses and technology maturation for sensing systems integration, platform data fusion integration and system orchestration, and advanced analytics for on-board autonomous systems, systems trades analyses, and software integration. Continue software development and maturation of current advanced multi-platform autonomous system orchestration efforts for integration into the Systems Integration Laboratory/Hardware Integration Laboratory. Continue software interfaces analyses with off-board systems connected to Joint All-Domain Command and Control enterprise. Continue integration of robust communications applications with industry for highly contested environments. Continue integrated systems testing and demonstration planning for test and evaluation on surrogates and experimentation platforms. Continue Systems Integration Laboratory/Hardware Integration Laboratory, ground, and flight test planning supporting system verification and validation activities. Initiate program transition planning and documentation development of the overall system to a non-Air Force Research Laboratory organization. ***FY 2024 Plans:*** Continue assessments, development and maturation, integration, and testing of advanced sensor fusion, robust communications, and platform orchestration technologies integrated with advanced computing hardware for autonomous unmanned systems at the tactical edge. Continue modeling, simulation, and analysis of system design trades and Model Based System Engineering activities for the air domain. Continue existing technology maturation plans for sensing systems integration for the air domain, platform data fusion integration and orchestration, and advanced analytics for on-board autonomous systems, systems trades analyses, and software integration. Initiate software development and maturation of software/hardware mission management and multi-platform autonomous system orchestration efforts with industry for integration into the Systems Integration Laboratory/ Hardware Integration Laboratory. Initiate software development interfaces with off-board systems connected to Joint All-Domain Command and Control enterprise. Continue integration of robust communications applications with industry for highly contested environments. Continue integrated systems testing and demonstration planning on experimentation platforms. Initiate hardware purchases for multi-platform flight testing and operational demonstration. Continue Systems Integration Laboratory/Hardware			

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Integration Laboratory, ground, and flight test planning and events supporting system verification and validation activities. Continue transition analysis, planning and documentation of the overall system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $15.370 million. Increase represents realignment of FY 2023 efforts from the WARTECH line within this project to provide a more complete picture of the Vanguard program and supports new software, hardware, and interface development efforts.			
Title: Vanguard Prospect - Long Range Kill Chain ***Description:*** The Department of the Air Force (DAF) is prototyping and testing advanced techniques that utilize data sources from all domains to form and maintain the best possible targeting information against challenging adversary threats. This effort matures key special communications techniques and hardware required to utilize the assembled targeting information in tactically relevant timelines. The hardware and techniques matured under this effort will be inserted into the end-to-end kill chain. ***FY 2023 Plans:*** Initiate development of special communications equipment and techniques suitable for transmitting and receiving fused target data to and from tactically relevant platforms within the required timelines for mission success. ***FY 2024 Plans:*** Complete development of special communications equipment and techniques suitable for transmitting and receiving fused target data to and from tactically relevant platforms, including over-the-air demonstrations. Initiate demonstration of over-the-air performance of special communications techniques with a specific radio intended for use in selected tactical platforms, including assessment against known and anticipated adversary threats. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $20.320 million. Increase represents realignment of FY 2023 efforts from the WARTECH line within this project to provide a more complete picture of the Vanguard program and accelerates development of specialized equipment and multiple high-level demonstrations, integration, and security incorporation.	0.000	5.566	25.882
Title: Vanguard Prospect - Area Effects Demonstration ***Description:*** The Vanguard Prospect Area Effects Demo advances the development of high-speed area effects concepts. The effort consists of modeling and simulation conducted in conjunction with aerodynamic ground testing to validate the simulation methodology. The physics-based computations and ground testing provide risk reduction for flight demonstrations. The demonstration and data collected from the ground and flight experiments facilitate advanced tool development and enable tailored high speed area effects concepts.	0.000	10.950	18.247

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FY 2023 Plans: Continue aerodynamic ground test campaign to generate data validation set. Continue pretest modeling of the aero-thermo ground test campaign. Continue the design, fabrication, and integration of the aero-thermo ground test activity. Initiate and complete the aero-thermo ground test activity. Continue modeling and analysis of flight test representative components. Initiate and complete the flight systems critical design review for flight hardware manufacture. Initiate the design and fabrication of the experimental test vehicle as well as the design, fabrication, and integration of the area effects concept. ***FY 2024 Plans:*** Continue validating modeling and simulation tools using data obtained through ground testing of various flight-representative components. Complete the design and fabrication of the experimental test vehicle as well as the design, fabrication, and integration of the area effects concept. Initiate and complete flight test integration activities to include software in the loop testing; hardware in the loop testing; environmental testing; and other form, fit, function, and acceptance testing. Initiate and complete a flight test demonstrating the area effects concept. Using the flight test results, evaluate the accuracy of the pre-test simulations and inform future tool development efforts. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $7.300 million. Increase represents realignment of FY 2023 efforts from the WARTECH line within this project to provide a more complete picture of the Vanguard program and supports multiple flight, environmental, and hardware in the loop test activities.			
Title: Vanguard Prospect - Fight Tonight ***Description:*** Develop and demonstrate a transformational gaming engine and Artificial Intelligence based military planning capability enabling the Department of the Air Force to develop, assess, and continuously adapt the employment of combat power at the pace and scale needed for peer conflict, achieving decision advantage across highly dynamic and contested environments. ***FY 2023 Plans:*** Continue development of software capability for theater scale plans rehearsal and analysis of plan options. Initiate development of plan adaptation from real-time data feeds. Initiate development of scalability and performance improvements to match pace and scale of target environment. Continue human-AI teaming assessment and apply findings to optimize system. Initiate demonstration of operational level planning capability on representative classified network and data, scaling software for digital plan rehearsal and plan adaptation and integrate with existing data used for operational mission. Initiate Systems Integration Laboratory deployment and user-driven assessment of software system effectiveness with Department of the Air	0.000	20.406	39.118

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Force operational planners. Initiate transition planning of the software systems to non-Air Force Research Laboratory partners to address critical process and technology gaps. ***FY 2024 Plans:*** Complete development of software capability for theater scale plans rehearsal and analysis of plan options. Complete development of plan adaptation from real-time data feeds. Complete development of scalability and performance improvements to match pace and scale of target environment. Continue human-AI teaming assessment and apply findings to optimize system. Continue demonstration of operational level planning capability on representative classified network and data, scaling software for digital plan rehearsal and plan adaptation and integrate with existing data used for operational mission. Initiate Systems Integration Laboratory deployment and user-driven assessment of software system effectiveness with Department of the Air Force operational planners. Continue and accelerate transition planning of the software systems addressing critical process and technology gaps. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $18.712 million. Increase represents realignment of FY 2023 efforts from the WARTECH line to provide a more complete picture of the Vanguard program and enables deployment of developed software components to network-accessible Systems Integration Laboratory, integration into DAF experiments and exercises, and acceleration of system transition.			
Title: Analysis for Emerging Vanguard Pipeline ***Description:*** Conduct operational analysis and mission thread engineering activities assessing military utility and cost-effective implementations of emerging technology opportunities under consideration in the WARTECH process. ***FY 2023 Plans:*** N/A ***FY 2024 Plans:*** Initiate activities performing modeling, simulation, and analyses assessing the military utility of candidate Transformational Component investments. Continue assessments informing decisions to promote candidate technologies in the WARTECH process. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $10.350 million. This increase represents a realignment of work from the WARTECH effort within this project to provide a more complete picture of the Vanguard program.	0.000	0.000	10.350
Title: Vanguard Pathfinder - Integrated Electronic Warfare	0.000	0.000	23.000

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Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603032F / *Future AF Integrated Technology Demos*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: The Department of the Air Force has a need to identify, protect against and counter evolving adversarial electromagnetic threats to enhance aircraft survivability and mission success. This effort identifies and assesses advanced electromagnetic, directed energy and cyber technologies to rapidly recognize threats from electromagnetic sources and protect against emerging threats with offensive and defensive electronic attack techniques. This effort includes algorithm and tool development with modeling, simulation and analysis and hardware-in-the loop testing. ***FY 2023 Plans:*** N/A ***FY 2024 Plans:*** Initiate activities assessing, integrating, and demonstrating advanced electronic warfare technology solutions, components and sub-systems, to accomplish warfighter relevant engagements at scale. Initiate implementation of open, flexible, and reprogrammable hardware and software architectures, applications and algorithms that enable threat environment data collection and analysis/synthesis to assess operationally optimized situational awareness and demonstrate countermeasures, waveforms/ techniques against modern and emerging threats in challenging electromagnetic (EM) spectrum operating environments. Initiate activities integrating, demonstrating, and advancing the technical maturity of software algorithms, adaptive techniques and autonomy-based approaches and assess awareness of and responses to threats across the EM spectrum. These activities include the integration and demonstration of hardware and software applications and algorithms in simulated environments and field experiments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $23.000 million. This increase establishes the activities necessary to begin the transformational portion of this capability maturation effort.			
Title: Vanguard Pathfinder - Integrated Networks	0.000	0.000	12.502
Description: The Department of the Air Force has a need to communicate with Joint partners and to provide battle management during complex military operations. This effort identifies and assesses accessible, resilient, and secure bi-directional information exchange technology solutions, components and sub-systems, to enable seamless movement of data to the right place at the right time informing effective decision making on military relevant timescales. Efforts support the integration of applications and algorithms into flexible hardware and software architectures to achieve movement of appropriate data across multiple security levels, and modeling and simulation to assess information exchanges for large-scale all-domain warfighter operations. ***FY 2023 Plans:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603032F / *Future AF Integrated Technology Demos*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
N/A ***FY 2024 Plans:*** Initiate efforts identifying technology in the areas of next-generation cross domain solutions incorporated into flexible networking architectures demonstrating the technical feasibility of improved communication methods. Initiate supporting emulation efforts establishing the scalability of emerging technologies. These activities may include the integration and demonstration of hardware and software applications and algorithms in simulated environments and field experiments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $12.502 million. This increase establishes the activities necessary to begin the transformational portion of this capability maturation effort.			
Title: Vanguard Pathfinder - Enabling Technology for Agile Basing ***Description:*** The Department of the Air Force is evaluating agile basing concepts to prepare against threats to its forward operating bases from evolving adversary capabilities. This effort encompasses assessment and maturation of technologies that will enhance survivability in agile basing scenarios. ***FY 2023 Plans:*** N/A ***FY 2024 Plans:*** Initiate activities developing technologies and metrics evaluating effectiveness of technologies for improving resilience of agile operating bases. Initiate efforts maturing capabilities that invoke a combination of techniques and technologies in support of agile basing defense, enable modeling and simulation to assess their effectiveness and vulnerabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $13.000 million. This increase establishes the activities necessary to begin this transformational capability maturation effort.	0.000	0.000	13.000
Title: Vanguard Pathfinder - Advanced Emulation for Test and Training ***Description:*** The Department of Air Force has a need to prepare our forces for joint military operations through simulation of major conflicts and training activities. This effort integrates, assesses and demonstrates mature science and technology solutions supporting test and training in the synthetic environment to enable future force operations. ***FY 2023 Plans:***	0.000	0.000	14.950

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603032F / *Future AF Integrated Technology Demos*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
N/A ***FY 2024 Plans:*** Initiate development and demonstration of a Synthetic Operational Test and Training Infrastructure capability to support test, training, and experimentation for multi-domain operations by integrating high-fidelity command and control functions with existing test and training infrastructure. Initiate cross disciplinary research for autonomous collaborative platform development to further enhance system integration laboratory supporting next-generation autonomy. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 funding increased compared to FY 2023 by $14.950 million. This increase establishes the activities necessary to begin the transformational portion of this capability maturation effort.			
Accomplishments/Planned Programs Subtotals	103.886	158.887	255.855

	FY 2022	FY 2023
Congressional Add: Program increase - automated geospatial intelligence detection algorithms	0.000	5.000
FY 2022 Accomplishments: Not applicable.		
FY 2023 Plans: Conduct Congressionally directed efforts.		
Congressional Adds Subtotals	0.000	5.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Not applicable