Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*							
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	-	182.691	121.188	169.836	0.000	169.836	-	-	-	-	-	-
655050: *TDL System Integration*	-	182.691	109.647	119.252	0.000	119.252	-	-	-	-	-	-
655262: *Family of Gateways*	-	0.000	11.541	50.584	0.000	50.584	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Tactical Data Networks Enterprise (TDNE) develops, enhances and fields Tactical Data Links (TDL) including internet protocol (IP) networks, advanced waveforms, radios, network management tools, and associated hardware and software that comprise the Joint Aerial Layer Network (JALN). This will be accomplished by upgrading currently fielded communications and TDL systems and IP networks. The upgrades will be effected by the development and fielding of more advanced systems in support of the Advanced Battle Management System (ABMS). ABMS is a family of systems which provides capabilities consisting of air, land, and maritime surveillance, tactical communications and networking, integrated with battle management command and control in support of Joint forces. ABMS is an integral component to transition to the Joint All Domain Command and Control (JADC2) concept at the tactical level of warfare. TDNE supports the development, fielding and training of aerial layer networking capabilities across multiple force projection missions including air superiority, ground precision attack, command and control, intelligence, surveillance and reconnaissance (ISR), and personal recovery while integrating capabilities with space operations. TDNE also addresses warfighter urgent demands through the establishment of Quick Reaction Capabilities (QRC) and enterprise activities. TDNE executes quick reaction response capability requests by the warfighter and support activities (including ramp-up) associated with the JALN enterprise. This program ensures the continued enhanced interoperability of Air Force and joint/coalition/NATO assets through efforts such as early systems engineering for program requirements analysis and architectural design development/ coordination of all TDN standards and management capabilities, configuration management, platform/system interoperability assessments, development of government reference architectures, interoperability certification testing, and flight testing. The aerial layer extends to interfacing with space communication assets (both military and commercial). An example of this interface work includes the use of the Protected Tactical Waveform (PTW) designed to mitigate the effects of advanced jamming in Anti-Access/Area Denial environments.). PTW provides worldwide, beyond line of sight, Anti-Jam (AJ), Low Probability of Intercept communications, via military and commercial satellite systems for tactical users in all services. It includes terminal certification efforts (Information Assurance (IA), NSA and MIL-STD). PTW development activities may include technical and acquisition-related studies, analysis, early systems engineering and risk reduction activities, addressing all subsystems to support both current program planning/execution and future AF program planning. This effort also funds PTW modem development and aperture development on suitable platforms. Satellite communication efforts includes all necessary system components to leverage commercially available space assets such as antennas modems, and network management support systems.

TDL System Integration will provide for the study (acquisitions current and proposed), analysis, enhancement, development, integration, demonstration, test, and evaluation of TDLs as a subset of the broader aerial layer networks. TDLs are used in both peace time and combat environments to exchange information such as character-oriented and fixed-formatted messages, data, radar tracks, target information, platform status, imagery, free-text messaging and command assignments. TDLs provide interoperability, local and global connectivity, and situational awareness to the user when training or fighting under rapidly changing operational conditions. TDLs increase mission effectiveness by providing enhanced air domain situational awareness, positive combat identification of aircraft in the network, fusion/correlation of on- and off-board sensor data, digital sharing of machine-to-machine target and threat information, thereby, enabling time critical targeting and other mission assignment

tasking. TDLs are used by all service theater command and control (C2) elements, weapons platforms, and sensors. TDLs include, but are not limited to: Link 16, Link 11, Link 22, Situational Awareness Data Link (SADL), Variable Message Format (VMF), , and other Advanced TDL Link technologies, such as Tactical Targeting Network Technology (TTNT), Common Data Link (CDL), Intra-Flight Data Link (IFDL) and Multifunction Advanced Data Link (MADL) . SATURN (Second-Generation Anti-Jam Tactical UHF Radio for NATO) is the next generation UHF line-of-sight link and is required to support a resilient voice and data capability for operations in a contested environment. A DoD CIO mandate requires transition from the HQII waveform to the SATURN waveform as the standard for UHF line of sight air-to-air and air-to-ground communications interoperability no later than Dec 31, 2023. Agile Communications includes the capability to share tactically significant information within/ to/from highly contested environments in support of the Air Superiority 2030 Flight Plan. Agile Communication efforts provide processes and coordination for enterprise communication development activities. High Capacity Backbone (HCB), a subset of the overall ABMS plan, will provide the warfighter with a robust communication infrastructure enhancing C2 capabilities. HCB connects users operating within disadvantaged conditions to space and terrestrial communications utilizing Deployed Ground Entry Points (DGEP) and aerial nodes. Tactical Data Link Planning, Analysis and Planning (TDL PAM) provides a tool to monitor, troubleshoot and repair any issues with Link 16 network. Link 16 Enhancements will develop and field an advanced signal processing capability on Airborne platforms to address threats in the contested and highly contested environments. To address future Advanced Tactical Datalinks, development of a Software Programmable OMS compliant (SPOC) radio terminal prototype is being built and tested. SPOC will provide a next generation radio set capable of hosting a variety of advanced tactical datalinks which aligns with the ABMS plan, and allows for more than one waveform operating simultaneously resulting in improved connectivity and situational awareness for the warfighter.

Communication gateways are necessary to support systems of systems integration and the delivery of information exchanges across disparate physical and logical network pathways. Gateway functions include enabling interoperability between data formats, protocols, and communication mediums. Additionally, gateway functions extend the connectivity range, consolidate data from multiple networks into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, and fuse/correlate data from multiple sources to improve accuracy. Gateway functions also provide application hosting, shared data storage, on-demand information access, smart data forwarding, and system monitoring and network management. Family of Gateways provides for the study (acquisitions current and proposed), analysis, enhancements, development, integration, costing, demonstration, test, and evaluation efforts related to future TDL communications development that will allow joint combat forces to exchange information quickly and accurately by bridging discrete airborne, terrestrial, maritime, and space-based C4ISR networks producing operational effects not possible within individual networks. Additionally, Family of Gateways will support enhancements of existing TDL performance, through upgrades and engineering analysis of system designs. Efforts in this project include waveform, ground, and rapid acquisition activities supporting Air Force requirements for communication bridging across multiple platforms, sources and communication domains.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Tactical Data Network system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY20 $0.347M expended and in FY21 $0.494M is estimated for civilian pay expenses in this program element.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*			R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*		
B. Program Change Summary ($ in Millions)	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**
Previous President's Budget	189.631	131.909	171.716	0.000	171.716
Current President's Budget	182.691	121.188	169.836	0.000	169.836
Total Adjustments	-6.940	-10.721	-1.880	0.000	-1.880
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	-10.721			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-6.940	0.000			
• Other Adjustments	0.000	0.000	-1.880	0.000	-1.880

Change Summary Explanation

FY 20: Decrease 6.940M FY 20 Small Business Innovation Research (SIBR)

FY 21: Decrease of 10.721M based on Congressional Mark.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*	Project (Number/Name) 655050 / *TDL System Integration*	

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
655050: *TDL System Integration*	-	182.691	109.647	119.252	0.000	119.252	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Tactical Data Links (TDL) System Integration provides for the study, analysis, enhancement, development, integration, demonstration, joint/coalition/NATO interoperability exercises, costing, test, trials, and evaluation of TDL as a subset of the broader aerial layer network. TDLs are used in both peacetime and combat environments to exchange information such as character-oriented and fixed-formatted messages, data, radar tracks, target information, platform status, imagery, free-text messaging and command assignments. TDLs provide interoperability, local and global connectivity, and situational awareness to the user when training or fighting under rapidly changing operational conditions. TDLs increase mission effectiveness by providing enhanced air domain situational awareness, positive combat identification of aircraft in the network, fusion/correlation of on- and off-board sensor data, digital sharing of machine to machine target and threat information and, thereby, enabling time critical targeting and other mission assignment tasking. TDLs are used by all service, NATO, and coalition theater C2 elements, weapons platforms, and sensors.

The number of Air Force platforms hosting TDLs has expanded from C2 aircraft (E-3, E-8, E-11A, EQ-4B, etc.) to the fighter, bomber, intelligence, surveillance and reconnaissance (ISR), tanker, airlift and other tactical fleets (F-15, F-16, F-22A, Rivet Joint, B-1, B-2, B-52, KC-46, etc.), as well as precision guided munitions. Utilization of TDLs in joint and international environments requires the integration of terminals into host platforms and interoperability of TDL networks across all deployed joint/Coalition/NATO platforms. Recent mandates require additional studies and analysis in order to meet frequency reprogramming and cryptographic requirements.

High Capacity Backbone (HCB) effort implements an incremental approach for deploying resilient reach back connectivity to DISN services and in-theater rear echelon organizations through dedicated aerial gateways and opportunistic airborne nodes. The HCB Transport supports a robust deployable ground infrastructure required, through reach back, range extension and payload control. It will use an open system approach composed of non-proprietary government and commercial interface standards. Link 16 Enhancement will develop and field advanced signal processing capabilities on 4th and 5th generation platforms to address threats in the contested and highly contested environments.

Efforts in this project include waveform and integration activities.
Waveform:
Waveform activities include, but are not limited to, enabling and supporting Joint Interoperability of Tactical Command and Control Systems (JINTACCS), joint/Coalition/NATO Interoperability, Link 16 enhancements, and development of a next generation waveform and/or advanced tactical data link. Funding will provide training, logistics development, testing and certification of individual TDL implementations to joint/allied standards, establishment of service-wide network management procedures/operations, and system-wide enhancements/testing, demonstration and experimentation.
Integration:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655050 / *TDL System Integration*

Integration activities include but are not limited to, Data Link Test Facility (DTF), MIDS JTRS, Air Force Participating Test Unit (AFPTU), Interoperable System Management and Requirements Transformation (iSMART), Network Centric Capability Assessment (NCCA), NATO interoperability, Coalition interoperability, TDL Planning, Analysis, and Monitoring (TDL PAM), integration analysis of C2 of JALN, Combat Cloud, Protected Tactical Waveform (PTW) and analysis of integration on platforms of existing TDN systems, system-of-systems analysis. Funding will ensure continued enhanced interoperability of Air Force/joint/Coalition/NATO assets through efforts such as early systems engineering for program requirements analysis and architectural design development/coordination of all TDN standards and management capabilities, configuration management, platform/system interoperability assessments, development of government reference architectures, integration of cyber technologies, interoperability certification testing, and flight testing, demonstration and experimentation.

Activities also include studies, prototypes and analysis (engineering and cost) to support both current program planning and execution and future program planning efforts for Tactical Data Networks (TDN), including development of joint concepts for C2, Analysis of Alternatives (AoA) follow-on analysis, gateway planning, and Advanced Battle Management systems (ABMS).

Activities will also include joint/Coalition/NATO Interoperability that provides program office system engineering to support Foreign Military Sales (FMS).
Agile Communications include the capability to share tactically significant information within/to/from highly contested environments in support of the Air Superiority 2030 Flight Plan. Agile Communication efforts provide for pre-Analysis of Alternatives (AoA) and development activities. Agile Communications supports the application of open standards & advanced apertures over an Enterprise-wide Aerial Network, enabling all platforms to share combat-relevant data/info to, from & within the Highly Contested Environment (HCE).
This program element may include necessary civilian pay expenses required to manage, execute, and deliver WEAPON SYSTEM capability.
The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0604281F" .
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Tactical Data Networks (TDN) Integration	64.151	26.862	42.781	0.000	42.781
Description: TDN Integration activities include but are not limited to, Data Link Test Facility (DTF), Air Force Participating Test Unit (AFPTU), Network Centric Capability Assessment (NCCA), Joint/Coalition/NATO Interoperability, Analysis of Alternatives (AoA) follow-on, gateway planning as well as Joint Interoperability of Tactical Command and Control Systems (JINTACCS) ensures interoperability of TDL systems with associated joint, allied, and Coalition systems. It includes configuration management of TDL Military Standards (MIL-STDs), TDL message development, interoperability test/certification, and TDL message standard implementation using interoperable System Management and Requirements Transformation (iSMART) for Link 11A/B, Link 16, Link 22, Variable Message Format (VMF), Integrated Broadcast Service (IBS), Intra-flight Data Link (IFDL), Multifunction Advanced Data Link (MADL), and others. Full Motion Video (FMV) Extended Unified Relay (FEURY) system development.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655050 / *TDL System Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
FY 2021 Plans: -Managing the development, certification, training and logistics plans for individual TDL implementations to Joint/allied standards. -Providing the necessary engineering, technical, and administrative support required to add and/or update Air Force platform and system information exchange requirements -Ensuring compatibility and interoperability of TDLs by funding required Air Force/joint MIL-STD compliance and interoperability tests -Ensuring compatibility and interoperability of TDLs by developing TDL messaging capability to address new or updated operational requirements ***FY 2022 Base Plans:*** -Will continue to manage the development, certification, training and logistics plans for individual TDL implementations to Joint/ allied standards. -Will continue to provide the necessary engineering, technical, and administrative support required to add and/or update Air Force platform and system information exchange requirements -Will continue to ensure compatibility and interoperability of TDLs by funding required Air Force/joint MIL-STD compliance and interoperability tests -Will continue to ensure compatibility and interoperability of TDLs by developing TDL messaging capability to address new or updated operational requirements -Will further develop FEURY systems ***FY 2022 OCO Plans:*** -Will further develop FEURY systems ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increases based on increased scope of analysis efforts for AFPTU (AF Participating Unit), JINTACC (Joint Interoperability of Tactical Command & Control System), NATO interoperability, Coalition, MAVRK, AeroNet (Airborne Extensible Relay and Over the Horizon Network Technology)					
Title: High Capacity Backbone (HCB) ***Description:*** High Capacity Backbone (HCB) is an expeditionary dynamic network made up of aerial and ground nodes that augment existing communication networks to greatly increase connectivity, network capacity, and information sharing at all security levels in order to effectively employ military capability across the range of	51.000	27.719	35.531	-	35.531

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
military operations. HCB reduces joint forces reliance on limited, relatively fixed/static satellite and surface line-of-sight communication components. HCB rapid prototyping is a demonstration of HCB network transport installed in existing USAF aircraft and deployable ground entry points that meets this Rapid Prototyping Requirements Document's threshold technical and functional requirements while operating as an integral part of an aerial layer network in a realistic operational environment HCB capabilities are required to close four specific capability gaps: network connectivity, network capacity, share information and data, and network management. ***FY 2021 Plans:*** -Developing airborne and ground prototypes -Conducting test of the prototypes ***FY 2022 Base Plans:*** -Will continue the development of the airborne and ground prototypes -Will conduct test of the prototypes -Will develop a follow-on contract for fielding of the HCB that will be fielded on various airborne platforms ***FY 2021 to FY 2022 Increase/Decrease Statement:*** High upfront initial equipment purchases drove higher numbers in FY20 to get prototyping efforts started. Ramp up in FY22 is to refine prototypes into production ready hardware & software and increased testing (both ground/flight) as efforts shift into production and fielding.					
Title: Protected Tactical Waveform (PTW) ***Description:*** Protected Tactical Waveform (PTW) is a waveform designed to mitigate the effects of advanced jamming in Anti- Access/Area Denial environments. PTW provides worldwide, beyond line of sight, Anti-Jam (AJ), Low Probability of Intercept communications, via military and commercial satellite systems for tactical users in all Services. This effort funds PTW modem development and aperture development on suitable platforms to include but not limited to; F-35, RQ-4 Global Hawk and EQ-4B/E-11A Battlefield Airborne Communications Node (BACN). PTW provides communications path diversity by increasing SATCOM resilience through satellite, spectral, and waveform diversity. This effort continues work started in Protected Tactical Service Field Demonstration (PTSFD) to complete PTW maturity and modem development, leveraging TALON Tacet Avis aperture work to develop PTW antenna and radome. It includes terminal certification efforts (Information Assurance (IA), NSA and MIL-STD). This effort funds continued development of PTW components, protected	10.000	9.982	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
tactical terminal modems that will be capable of being fully integrated into existing wideband terminals and will ensure delivery of protected tactical SATCOM to the joint and coalition warfighters in contested, degraded environments. PTW development activities may also include technical and acquisition related studies, analysis, and early systems engineering and risk reduction activities addressing all subsystems to support both current program planning/execution and future AF program planning. Funds for this major thrust are reprogrammed from BPAC 655262, Family of Gateways, for the amount of $50.584M. ***FY 2021 Plans:*** -Continue to mature requirements for future PTW modem development. -Develop a standards-based PTW modem with Anti-Jam (AJ) capability to augment existing Aerial SATCOM terminals across vendors and platforms. -Continue addition of COMSEC capability to allow use of classified data and fully certify the crypto to be able to encrypt data for multiple waveforms. ***FY 2022 Base Plans:*** -Continue the development, integration and testing of an airborne modem that will be utilized by fighter and wide-body aircraft. -Develop a standards-based PTW modem with Anti-Jam (AJ) capability to augment existing Aerial SATCOM terminals across vendors and platforms. -Continue addition of COMSEC capability to allow use of classified data and fully certify the crypto to be able to encrypt data for multiple waveforms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Ramp up in FY22 is to refine prototypes into production ready hardware & software and increased testing (both ground/flight) as efforts shift into production and fielding.					
Title: Agile Comms ***Description:*** Agile Comms supports the application of open standards and advanced apertures over an Enterprise-wide Aerial Network, enabling all platforms to share combat-relevant data/info to, from and within the Highly Contested Environment. It supports the application of open standards and advanced apertures over the enterprise-wide Aerial Network, enables all platforms to share combat relevant data/info to, from and within the Highly Contested Environment. Finally, funding supports planning, data collection, and analysis for initial technology maturation experimentation campaign.	34.712	25.272	31.532	-	31.532

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
FY 2021 Plans: - Conducting post ICD and pre AoA activities including the development of the Architecture and Enterprise Approach to the Joint Aerial Network ***FY 2022 Base Plans:*** - Will continue post ICD and pre AoA activities including the development of the Architecture and Enterprise Approach to the Joint Aerial Network ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Requirements and funding increase are based on increased scope of analysis & prototyping for emerging ABMS efforts.					
Title: Link 16 Enhancements ***Description:*** Link 16 Enhancement will develop and field Link 16 Anti Jam (AJ) capabilities on 4th and 5th generation platforms to address Link 16 jamming threats in the contested and highly contested environments. This effort will implement Link 16 technologies into TDL terminals and investigate the integration of additional emerging technologies to improve communications reliability. This effort will maintain a government-controlled technical baseline(s) to efficiently execute development and enhancements. Emerging technologies will be developed and evaluated for efficacy; recommendations will be identified for appropriate terminal fielding/ upgrades to platforms and will be considered when evaluating enterprise TDL capabilities/gaps. ***FY 2021 Plans:*** -Conducting development and operational test on integrated solution ***FY 2022 Base Plans:*** No funds ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Development funding drops as Link 16-specific enhancements such as enhanced throughput and concurrent multi-netting are completed and prepared for integration into payloads/platforms/terminals.	9.925	9.907	0.000	-	0.000
Title: SFF/DACAS Modernization and System-of-Systems (SoS) Enterprise Integration ***Description:*** This effort will support the development and demonstration of Small Form Factor (SFF) technologies that can support Digitally Assisted Close Air Support (DACAS) and other missions across the full spectrum of operating environments. This effort will consider System-of-Systems (SoS) engineering, technical	12.903	9.905	9.408	-	9.408

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
analysis/performance, platform integration, and Tactics, Techniques, and Procedures (TTPs) to best utilize technologies and acquisition approaches for enterprise modernization. SFF Phase II (TURTLE) will be a rapid prototyping and demonstration effort. ***FY 2021 Plans:*** -Developing and evaluating prototypes ***FY 2022 Base Plans:*** -Will continue the development of the phase 2 effort resulting in a new prototype -Will conduct testing of solutions with JTACS and TACP fielders ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funds is required to build, demonstrate, and deliver Phase II prototype airborne and ground terminals: -Funds development of a new prototype, and testing of solution -Support development and demonstration of technologies to support DACAS communications between air and ground forces -Develop a system-of-systems engineering approach to include technical analysis/performance, platform integration, and TTPs to best utilize enterprise modernization.					
Accomplishments/Planned Programs Subtotals	182.691	109.647	119.252	0.000	119.252

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• RDTE 07 PE 0207448F: *C2ISR TDL*	1.531	1.559	1.587	-	1.587	-	-	-	-	-	-
• APAF 05 Line Item F01500: *F-15*	53.211	40.167	20.933	-	20.933	-	-	-	-	-	-
• APAF 05 Line Item F01600: *F-16*	8.371	8.525	8.695	-	8.695	-	-	-	-	-	-
• APAF 05 Line Item B00200: *B-2A*	0.201	0.206	0.210	-	0.210	-	-	-	-	-	-
• APAF 05 Line Item B01B00: *B-1B*	0.000	0.000	0.000	-	0.000	-	-	-	-	-	-
• OPAF 03 Line Item 834010: *General Information Technology*	0.180	1.698	1.701	-	1.701	-	-	-	-	-	-

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
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D. Acquisition Strategy

The Airborne Networking Directorate provides for common development, integration, and interoperability across the entire airborne network and ensures that data links are procured and maintained as a joint, end-to-end command and control system. Platform acquisition strategies vary by program, but the majority of development and integration is normally accomplished by the weapon system prime contractor.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TDN Integration	Various	Various : Various	-	48.990	Jan 2020	27.520	Jan 2021	28.325	Jan 2022	-		28.325	-	-	-
High Capacity Backbone (HCB)	C/TBD	Various : Various	-	51.000	Mar 2020	27.719	Mar 2021	35.331	Mar 2022	-		35.331	-	-	-
Agile Comms	Various	Various : Various	-	34.712	Apr 2020	25.272	Apr 2021	31.532	Jan 2022	-		31.532	-	-	-
SFF/DACAS Modernization and SoS Enterprise	Various	Various : Various	-	12.903	Jan 2020	9.905	Apr 2021	9.408	Jan 2022	-		9.408	-	-	-
Link 16 Enhancements	Various	Various : Various	-	9.925	Apr 2020	9.907	Apr 2021	-		-		-	-	-	-
Protected Tactical Waveform (PTW)	C/TBD	Not specified. : TBD	-	14.888	Mar 2020	-		-		-		-	-	-	-
		Subtotal	-	172.418		100.323		104.596		-		104.596	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TDN Integration - DTF	PO	46th Test Squadron : Eglin AFB, FL	-	2.400	Jan 2020	0.000	Jan 2021	1.500	Dec 2021	-		1.500	-	-	-
JINTACCS	C/FFP	Spectrum Comm Inc : Newport News, VA	-	1.478	Mar 2020	3.048	Feb 2021	3.815	Mar 2022	-		3.815	-	-	-
TDN Integration - AFPTU	Various	Various : Various	-	2.350	Aug 2020	2.156	Aug 2021	2.336	Jan 2022	-		2.336	-	-	-
		Subtotal	-	6.228		5.204		7.651		-		7.651	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TDN Integration PMA - A&AS support - NCCA,	C/CPAF	Various : Various	-	3.000	Dec 2019	3.000	Dec 2020	6.000	Apr 2022	-		6.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*	Project (Number/Name) 655050 / *TDL System Integration*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Coalition Interoperability, JALN AoA															
TDN Integration PMA - FFRDC support - Coalition Interoperability, JALN AoA	C/T&M	MITRE : Bedford, MA	-	0.200	Nov 2019	0.600	Sep 2021	0.510	Jan 2022	-		0.510	-	-	-
TDN Integration PMA - Travel, Government Purchase Cards, etc...DTF, NCCA, Coalition Interoperability, AFPTU, JALN AoA	Various	Various : Various	-	0.800	Oct 2019	0.500	Sep 2021	0.450	Sep 2022	-		0.450	-	-	-
JINTACCS PMA - Travel, Government Purchase Cards, etc...	Various	Various : Various	-	0.045	Oct 2019	0.020	Sep 2021	0.045	Sep 2022	-		0.045	-	-	-
		Subtotal	-	4.045		4.120		7.005		-		7.005	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	182.691		109.647		119.252		-		119.252	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655050 / *TDL System Integration*

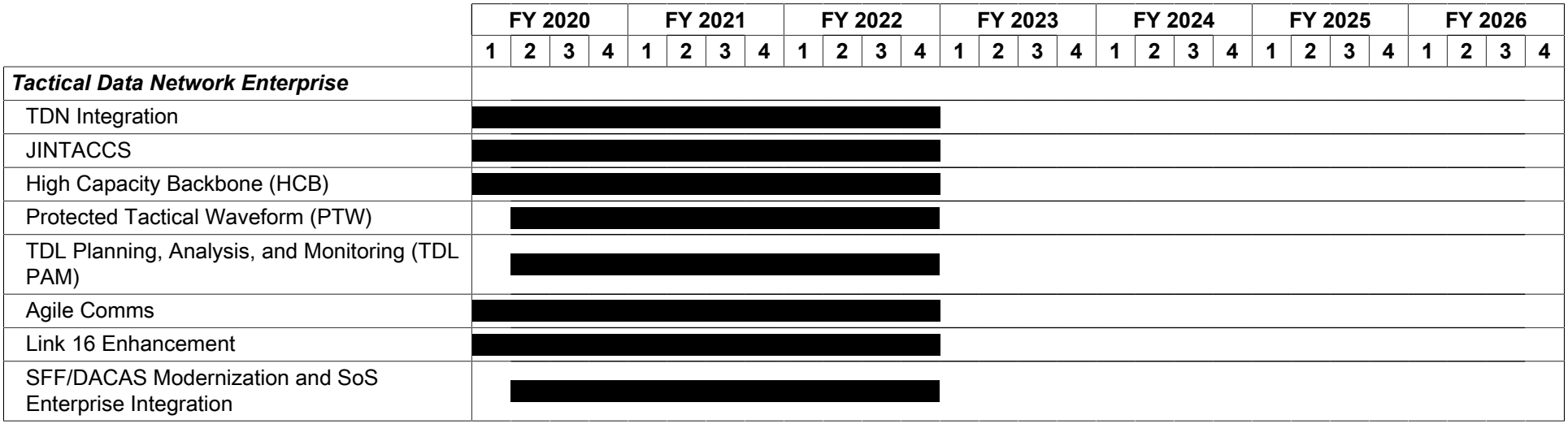

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655050 / *TDL System Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Tactical Data Network Enterprise				
TDN Integration	1	2020	4	2022
JINTACCS	1	2020	4	2022
High Capacity Backbone (HCB)	1	2020	4	2022
Protected Tactical Waveform (PTW)	2	2020	4	2022
TDL Planning, Analysis, and Monitoring (TDL PAM)	2	2020	4	2022
Agile Comms	1	2020	4	2022
Link 16 Enhancement	1	2020	4	2022
SFF/DACAS Modernization and SoS Enterprise Integration	2	2020	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*	Project (Number/Name) 655262 / *Family of Gateways*	

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
655262: *Family of Gateways*	-	0.000	11.541	50.584	0.000	50.584	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Family of Gateways provides for the study (acquisitions current and proposed), analysis, enhancement, development, integration, costing, demonstration, test, and evaluation efforts that will allow joint combat forces to exchange information quickly and accurately by bridging discrete airborne, terrestrial, maritime, and space-based C4ISR networks producing operational effects not possible within individual networks. Gateway functions include enabling interoperability between data formats, protocols, and communication mediums. Additionally, gateway functions extend the connectivity range, consolidate data from multiple networks into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, and fuse/correlate data from multiple sources to improve accuracy. Gateway functions also provide application hosting, shared data storage, on-demand information access, smart data forwarding, and system monitoring and network management. Family of Gateways will support to enhance existing TDL performance, through upgrades and engineering analysis of system designs.
Efforts in this project include waveform, ground, and rapid acquisition activities supporting Air Force requirements for communications bridging across multiple platforms, sources and communication domains.
Funds in this BPAC, 655262, Family of Gateways will be used in BPAC 655050, TDL System Integration under the same PE 0604281, Tactical Data Networks Enterprise.

Activities also include studies, analysis, demonstrations and experiments to support both current program planning/execution and future program planning efforts for Family of Gateways or other applicable platforms.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Tactical Data Network system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Protected Tactical Waveform (PTW)	0.000	11.541	50.584	-	50.584
Description: In FY 2022, PE 0604281F, TDNE, BPAC 655262, Family of Gateways efforts were transferred to PE 0604281F, TDNE, BPAC 655050, TDL System Integration, Project Protected Tactical Waveform (PTW) in order to further aerial terminals development and integration in Wide body, UAV and Fighter configurations.					
FY 2021 Plans: -See plans in BPAC 655050, TDL System Integration.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655262 / *Family of Gateways*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
-Continue to mature requirements for future PTW modem development. -Develop a standards-based PTW modem with Anti-Jam (AJ) capability to augment existing Aerial SATCOM terminals across vendors and platforms. -Continue addition of COMSEC capability to allow use of classified data and fully certify the crypto to be able to encrypt data for multiple waveforms. ***FY 2022 Base Plans:*** - See plans in BPAC 655050, TDL System Integration. -Continue the development, integration and testing of an airborne modem that will be utilized by fighter and wide-body aircraft. -Develop a standards-based PTW modem with Anti-Jam (AJ) capability to augment existing Aerial SATCOM terminals across vendors and platforms. -Continue addition of COMSEC capability to allow use of classified data and fully certify the crypto to be able to encrypt data for multiple waveforms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Ramp up in FY22 is to refine prototypes into production ready hardware & software and increased testing (both ground/flight) as efforts shift into production and fielding.					
Accomplishments/Planned Programs Subtotals	0.000	11.541	50.584	-	50.584

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• RDTE 07 PE 0207448F: *C2ISR TDL*	1.531	1.559	1.587	-	1.587	-	-	-	-	-	-
• APAF 05 Line Item F01500: *F-15*	53.211	40.167	20.933	-	20.933	-	-	-	-	-	-
• APAF 05 Line Item F01600: *F-16*	8.371	8.525	8.695	-	8.695	-	-	-	-	-	-
• APAF 05 Line Item B00200: *B-2A*	0.201	0.206	0.210	-	0.210	-	-	-	-	-	-
• APAF 05 Line Item B01B00: *B-1B*	0.000	0.000	0.000	-	0.000	-	-	-	-	-	-
• OPAF 03 Line Item 834010: *General Information Technology*	0.180	1.698	1.701	-	1.701	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655262 / *Family of Gateways*

C. Other Program Funding Summary ($ in Millions)

Line Item	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

Remarks

D. Acquisition Strategy

The Airborne Networking Directorate provides for common development, integration and interoperability across the entire airborne network and ensures that data links are procured and maintained as a joint, end-to-end, command and control system. Platform acquisition strategies vary by program, but the majority of development and integration is normally accomplished by the weapon system prime contractor. Contract approaches vary by program.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / *Tactical Data Networks Enterprise*	Project (Number/Name) 655262 / *Family of Gateways*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
5th to 4th Development	SS/CPAF	Not specified. : TBD	-	-		11.541	Dec 2020	-		-		-	-	-	-
Protected Tactical Waveform	TBD	Not specified. : TBD	-	-		-		50.584	Jan 2022	-		50.584	-	-	-
		Subtotal	-	-		11.541		50.584		-		50.584	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		11.541		50.584		-		50.584	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655262 / *Family of Gateways*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5th-to-4th Generation Gateway																												
5th-to-4th Generation Gateway Development	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 0604281F / *Tactical Data Networks Enterprise*	**Project (Number/Name)** 655262 / *Family of Gateways*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
5th-to-4th Generation Gateway				
5th-to-4th Generation Gateway Development	1	2020	3	2021