

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	242.328	189.631	131.909	0.000	131.909	171.716	166.618	61.734	71.811	Continuing	Continuing
655050: <i>TDL System Integration</i>	-	223.518	189.631	109.868	0.000	109.868	121.108	127.675	57.727	58.790	Continuing	Continuing
655262: <i>Family of Gateways</i>	-	18.810	0.000	22.041	0.000	22.041	50.608	38.943	4.007	13.021	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Tactical Data Networks Enterprise (TDNE) develops, enhances and fields Tactical Data Links (TDL), 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 by developing and fielding more advanced future systems in support of the Advance Battle Management System (ABMS). TDNE also addresses warfighter urgent demands through the establishment of Quick Reaction Capabilities (QRC) and Enterprise activities. TDNE supports the development, fielding and training of aerial layer networking capabilities across multiple core functions including air superiority, ground precision attack, command and control, intelligence, surveillance and reconnaissance (ISR), and personal recovery while integrating capabilities with space operations. TDNE executes quick reaction response capability requests by the warfighter and support activities (including ramp-up) associated with the Joint Aerial Layer Network (JALN) Enterprise activities. This program ensures the continued enhanced interoperability of Air Force and joint/coalition/NATO assets through efforts such as early systems engineering and use of the Political, Operational, Economic and Technical (POET) process 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. 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. 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.

TDL System Integration will provide for the study (acquisitions current and proposed), analysis, enhancement, development, integration, demonstration, test, and evaluation of Tactical Data Links (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), Intra-Flight Data Link (IFDL), and other Advanced TDL Link technologies, such as Tactical Targeting Network Technology (TTNT), Common Data Link (CDL), Multifunction Advanced Data Link (MADL), and Airborne Extensible Relay and Over the Horizon Network (AERONet). TDLs typically include both a waveform specification as well as the standards for exchanging messages. Agile Communications include the capability to share tactically significant information within/to/from highly contested environments in support of the Air

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	
<p>Superiority 2030 Flight Plan. Agile Communication efforts provide for pre-Analysis of Alternatives (AoA) and development activities. High Capacity Backbone (HCB), a subset of the overall JALN concept, 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 a 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.</p> <p>Family of Gateway provides for the study (acquisitions current and proposed), analysis, enhancements, 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. Further, this project supports 5th-to-4th Generation efforts and future TDL communications development. Additionally, 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 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 Enterprise weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F</p> <p>The FY 20 funding request was reduced by \$40 million to account for the availability of prior year execution balances.</p> <p>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.</p> <p>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.</p>		

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	270.015	229.631	202.397	0.000	202.397
Current President's Budget	242.328	189.631	131.909	0.000	131.909
Total Adjustments	-27.687	-40.000	-70.488	0.000	-70.488
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	-40.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-21.200	0.000			
• SBIR/STTR Transfer	-6.487	0.000			
• Other Adjustments	0.000	0.000	-70.488	0.000	-70.488

Change Summary Explanation

FY 2019:

- Project 655050, funding was increased by \$50.0 million congressional add to accelerate ABMS
- Project 655050, funding was increased by \$14.888 million as a technical adjustment for PTW
- Project 655050, funding was decreased by \$21.2 million for higher Air Force needs
- Project 655050, funding was decreased by \$6.487 million for Small Business Innovation Research

FY 2020:

- Project 655050, funding was decreased by \$40.0M to account for availability of prior year execution balance

FY 2021:

- Project 655050, funding was decreased by \$46.0M to account for availability of prior years execution balance
- Project 655262, \$24.5M was reprogrammed to PE 27417F (AWACS) for 5th to 4th Generation Gateway on E-3 risk reduction, development and integration

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 5					R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>				Project (Number/Name) 655050 / <i>TDL System Integration</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
655050: <i>TDL System Integration</i>	-	223.518	189.631	109.868	0.000	109.868	121.108	127.675	57.727	58.790	Continuing	Continuing
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.

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:
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 and use of the POET process for program requirements analysis and architectural design development/coordination

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>
--	--	--

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 of JALN, JALN Analysis of Alternatives (AoA) follow-on analysis, JALN 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).

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.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>Title: Tactical Data Networks (TDN) Integration</p> <p>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, Joint Aerial Layer Network (JALN) Analysis of Alternatives (AoA) follow-on, JALN 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.</p> <p>FY 2020 Plans:</p>	94.758	30.243	23.847	-	23.847

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>-Managing the development, certification, developmental training, and logistics plans for individual TDL implementations to joint/allied standards</p> <p>-Providing management with the necessary engineering, technical, and administrative support needed to facilitate development of systems, add and/or update Air force platform and system information exchange requirements</p> <p>-Planning for testing, integration, and associated training for MIDS JTRS upgrade configurations</p> <p>-Providing support to TDL interoperability testing of development and fielded systems through the DTF</p> <p>-Supporting and funded DoD-mandated TDL MIL-STD conformance testing and interoperability assessments for all TDL-capable Air Force platforms through the AFPTU and JINTACCS.</p> <p>-Conducting aerial layer network focused studies and analysis that support data link enhancements</p> <p>-Assessing tactical airborne network and network management gaps that are validated in existing requirements documents through the Network Centric Capability Assessments (NCCA)</p> <p>-Studies and analysis will include, but will not be limited to, supporting both current program planning and execution and future program planning efforts for TDN (e.g. development of joint concepts for C2 and network management of the Joint Aerial Layer Network, Combat Cloud, and JALN gateway planning)</p> <p>-Providing support to Coalition interoperability and provided program office system engineering to support NATO C3I, Foreign Military Sales (FMS) case development, FMS planning for technology refresh modifications, Crypto-Modernization, and Net Management</p> <p>-Providing support to the DTF and AFPTU with required hardware and software upgrades and license renewals, which provided development and interoperability support for new capabilities and technology growth</p> <p>-Providing support to Agile Communications efforts that include pre-Analysis of Alternatives (AoA) and development activities</p> <p>-Ensuring compatibility and interoperability of TDLS by developing TDL messaging capability to address new or updated operational requirements</p> <p>FY 2021 Base Plans:</p> <p>-Will continue to manage the development, certification, training and logistics plans for individual TDL implementations to Joint/allied standards.</p> <p>-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</p> <p>-Will continue to ensure compatibility and interoperability of TDLS by funding required Air Force/joint MIL-STD compliance and interoperability tests</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020			
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
-Will continue to ensure compatibility and interoperability of TDLs by developing TDL messaging capability to address new or updated operational requirements FY 2020 to FY 2021 Increase/Decrease Statement: Decrease due to rescoping of program. Changes to TDN Integration due to realigned budget to match Workload Master List (WML)					
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 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 such as exercise Northern Edge 2021. HCB capabilities are required to close four specific capability gaps: network connectivity, network capacity, share information and data, and network management. FY 2020 Plans: -Utilizing the HCB Rapid Prototyping Requirements document (RPRD) will issue/award a contract for the development of an airborne and ground prototype -Utilizing either MIT LL or the Data Link Enterprise ID/IQ to develop the airborne and ground nodes to address phase 1 requirements in the HCB RPRD -Investigating the develop of phased array or equivalent antenna to support the HCB demonstration -Developing a test plan for use at Northern Edge 21 FY 2021 Base Plans: -Will continue the development of the airborne and ground prototypes -Will conduct test of the prototypes at Northern Edge 21 -Will develop a follow-on contract for fielding of the HCB that will be fielded on various airborne platforms FY 2020 to FY 2021 Increase/Decrease Statement:	2.235	51.000	32.982	-	32.982

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020		
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Reduction due to focus of development scope					
<p>Title: Protected Tactical Waveform (PTW)</p> <p>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 like (but not limited to) 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 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.</p> <p>FY 2020 Plans: -Developing and testing of the PTWSAT radio terminal prototype</p> <p>FY 2021 Base Plans: No FY 21 funding</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: No funding projected in FY 21</p>	23.183	16.588	0.000	-	0.000
<p>Title: TDL Planning, Analysis, and Monitoring (TDL PAM)</p> <p>Description: The Air Force has a requirement for a TDL network planning, analysis and monitoring capability. TDL PAM's operational requirements are to support the Joint Interface Control Officer (JICO) in the Air and Space Operations Center (AOC); Regional Interface Control Officer (RICO) in the Control Reporting Center (CRC); and Interface Control Officers in the Defense Sectors during the execution and management of the Joint Multi-Tactical Data Link Network (MTN) architecture. Network complexity, large AORs, challenging terrain, and</p>	8.824	1.000	4.998	-	4.998

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020		
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
capacity issues within the MTN require a management tool that helps operators plan for the effective use of MTN capabilities. FY 2020 Plans: -Procuring LMMT for test and evaluation in the AOC, CRC, and the Defense Sectors weapon systems and continue funding LMMT incorporating AF requirements FY 2021 Base Plans: - Will test and evaluate LMMT system in the AOC, CRC, and the Defense Sectors weapon systems and will continue funding incorporation of AF requirements into LMMT FY 2020 to FY 2021 Increase/Decrease Statement: Increase due to ramp up in development and AF requirements integration into LMMT system					
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 (HCE). FY 2020 Plans: -Continuing post ICD and pre AoA activities including the development of the Architecture and Enterprise Approach to the Joint Aerial Network FY 2021 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 2020 to FY 2021 Increase/Decrease Statement: Ramp down in research and development ahead of procurement	72.942	64.212	25.257	-	25.257
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	0.000	25.685	13.925	-	13.925

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020		
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>			
B. Accomplishments/Planned Programs (\$ in Millions)					
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 2020 Plans: -Conducting development and operational test on integrated solution					
FY 2021 Base Plans: -Will conduct development and operational test on integrated solution					
FY 2020 to FY 2021 Increase/Decrease Statement: Decreased due to rescoping of effort					
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 analysis/performance, platform integration, and Tactics, Techniques, and Procedures (TTPs) to best utilize technologies and acquisition approaches for enterprise modernization.					
FY 2020 Plans: -Developing and evaluating prototype towards future testing					
FY 2021 Base Plans: -Will continue developing and evaluating prototypes -Will conduct testing of solutions					
FY 2020 to FY 2021 Increase/Decrease Statement: Increased due to ramp up in prototype evaluation					
Title: Applique Technologies for TDLs					
Description: This effort will develop and test low Size, Weight, and Power (SWaP) applique production kits to support TDL communications; it will incorporate proven techniques related to RF components, system interfaces, and platform integration. This effort will identify appropriate platforms, apertures, and interfaces and evaluate using representative flight environments and conditions.					
FY 2020 Plans:					
	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
	3.945	0.903	8.859	-	8.859
	0.631	0.000	0.000	-	0.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
-No FY20 funding FY 2021 Base Plans: -No FY21 funding FY 2020 to FY 2021 Increase/Decrease Statement: N/A					
Title: Link 16 Evolution Description: This effort implements 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 2020 Plans: -Working with MIDS PO to incorporate advanced signal processing algorithm in MIDS JTRS. Also, continue developing antennas for testing on F-15. FY 2021 Base Plans: -No FY21 funding FY 2020 to FY 2021 Increase/Decrease Statement: N/A	17.000	0.000	0.000	-	0.000
Accomplishments/Planned Programs Subtotals	223.518	189.631	109.868	-	109.868

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTE 07 PE 0207448F: <i>C2ISR TDL</i>	1.505	1.531	1.559	-	1.559	1.587	1.616	-	-	Continuing	Continuing
• APAF 05 Line Item F01500: <i>F-15</i>	46.903	53.211	40.167	-	40.167	20.933	21.310	-	-	Continuing	Continuing
• APAF 05 Line Item F01600: <i>F-16</i>	6.755	8.371	8.525	-	8.525	8.695	8.851	-	-	Continuing	Continuing
• APAF 05 Line Item B00200: <i>B-2A</i>	2.315	0.201	0.206	-	0.206	0.210	0.213	-	-	Continuing	Continuing
• APAF 05 Line Item B01B00: <i>B-1B</i>	0.000	0.000	0.000	-	0.000	0.000	0.000	-	-	Continuing	Continuing

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• OPAF 03 Line Item 834010: <i>General Information Technology</i>	0.177	0.180	1.698	-	1.698	1.701	1.731	-	-	Continuing	Continuing

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.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>
--	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TDN Integration	Various	Various : Various	-	91.052	Jan 2019	17.500	Jan 2020	11.851	Jan 2021	-		11.851	Continuing	Continuing	-
TDN Integration - TDL PAM	MIPR	Various : Various	-	5.998	Feb 2019	1.000	Mar 2020	4.998	Feb 2021	-		4.998	Continuing	Continuing	-
High Capacity Backbone (HCB)	C/TBD	Various : Various	-	2.235	Mar 2019	51.000	Mar 2020	32.982	Mar 2021	-		32.982	Continuing	Continuing	-
Agile Comms	Various	Various : Various	-	72.942	Mar 2019	64.212	Apr 2020	25.257	Apr 2021	-		25.257	Continuing	Continuing	-
SFF/DACAS Modernization and SoS Enterprise	Various	Various : Various	-	3.945	Mar 2019	0.903	Jan 2020	8.859	Apr 2021	-		8.859	Continuing	Continuing	-
Applique Technologies for TDLs	Various	Various : Various	-	0.631	Mar 2019	0.000	Mar 2020	-		-		-	Continuing	Continuing	-
Link 16 Evolution (LRS)	Various	Various : Various	-	9.400	Mar 2019	5.260	Mar 2020	-		-		-	Continuing	Continuing	-
Link 16 Enhancements	Various	Various : Various	-	0.000	Apr 2019	24.481	Apr 2020	13.925	Apr 2021	-		13.925	Continuing	Continuing	-
Protected Tactical Waveform (PTW)	C/TBD	Not specified. : TBD	-	23.183	Jun 2019	14.888	Mar 2020	-		-		-	Continuing	Continuing	-
Subtotal			-	209.386		179.244		97.872		-		97.872	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
TDN Integration - DTF	PO	46th Test Squadron : Eglin AFB, FL	-	2.510	Dec 2018	0.500	Jan 2020	1.500	Jan 2021	-		1.500	Continuing	Continuing	-
JINTACCS	C/FFP	Spectrum Comm Inc : Newport News, VA	-	2.371	Feb 2019	4.545	Mar 2020	4.000	Feb 2021	-		4.000	Continuing	Continuing	-
TDN Integration - AFPTU	Various	Various : Various	-	1.724	Sep 2019	2.897	Aug 2020	2.336	Aug 2021	-		2.336	Continuing	Continuing	-
Subtotal			-	6.605		7.942		7.836		-		7.836	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
<i>Tactical Data Network Enterprise</i>																												
TDN Integration																												
JINTACCS																												
High Capacity Backbone (HCB)																												
Protected Tactical Waveform (PTW)																												
TDL Planning, Analysis, and Monitoring (TDL PAM)																												
Agile Comms																												
Link 16 Enhancement																												
SFF/DACAS Modernization and SoS Enterprise Integration																												
Applique Technology for TDLs																												
Link 16 Evolution																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655050 / <i>TDL System Integration</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Tactical Data Network Enterprise</i>				
TDN Integration	1	2019	4	2025
JINTACCS	1	2019	4	2025
High Capacity Backbone (HCB)	1	2019	4	2025
Protected Tactical Waveform (PTW)	2	2019	4	2020
TDL Planning, Analysis, and Monitoring (TDL PAM)	2	2019	4	2025
Agile Comms	1	2019	4	2025
Link 16 Enhancement	1	2019	4	2020
SFF/DACAS Modernization and SoS Enterprise Integration	2	2019	4	2022
Applique Technology for TDLs	1	2019	4	2019
Link 16 Evolution	1	2019	4	2020

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655262 / <i>Family of Gateways</i>
--	--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
655262: <i>Family of Gateways</i>	-	18.810	0.000	22.041	0.000	22.041	50.608	38.943	4.007	13.021	Continuing	Continuing
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. Funding in this project supports 5th-to-4th Generation Communications Capabilities, and 5th-to-5th Generation efforts and future TDL communications development. Additionally, 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: 5th-to-4th Generation Gateway	4.915	0.000	22.041	-	22.041
Description: 5th-to-4th Generation Communications Capability facilitates sharing track and sensor data between 5th Generation and 4th Generation aircraft as well as Command and Control (C2) nodes. These capabilities enable interoperability between data formats, protocols, and communication mediums. Additionally, these capabilities extend the connectivity range, consolidate data from multiple networks, domains and sensors into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, and correlate data from multiple sources to facilitate early detection and tracking while enabling collaborative targeting. The addition of multi-domain capabilities as a future requirement of the 5th-to-4th Generation					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655262 / <i>Family of Gateways</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>Communications Capability enables track sharing at the tactical edge for the timely execution of ground and airborne target sets. These additional capabilities are a combat force multiplier that enhance total force synergy for target prosecution and weapons employment.</p> <p>FY 2020 Plans: -Finalizing RFP for integrating 5th-to-4th Generation Communications Capabilities into the E-3 platforms</p> <p>FY 2021 Base Plans: -Will continue integration of 5th to 4th Generation communication Capabilities into the E-3 platform</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Platform funded effort in FY20</p> <p>Title: BACN Program of Record</p> <p>Description: An Acquisition Decision Memorandum (ADM) was signed 30 March 2018 which establishes the BACN Joint Urgent Operational Need (JUON) as a PoR. This ADM defined the PEO as the Milestone Decision Authority (MDA) and approved entry into the Defense Acquisition System (DAS) as a ACAT III, Post-Milestone C program in the Operations and Support (O&S) phase.</p> <p>FY 2020 Plans: -No funds in FY20</p> <p>FY 2021 Base Plans: -No funds in FY21</p> <p>FY 2021 OCO Plans: No OCO funding</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	13.895	0.000	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	18.810	0.000	22.041	0.000	22.041

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655262 / <i>Family of Gateways</i>

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

Line Item	FY 2019	FY 2020	FY 2021	FY 2021	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Cost To	
			Base	OCO	Total					Complete	Total Cost
• RDTE 07 PE 0207448F: <i>C2ISR TDL</i>	1.505	1.531	1.559	-	1.559	1.587	1.616	-	-	Continuing	Continuing
• APAF 05 Line Item F01500: <i>F-15</i>	46.903	53.211	40.167	-	40.167	20.933	21.310	-	-	Continuing	Continuing
• APAF 05 Line Item F01600: <i>F-16</i>	6.755	8.371	8.525	-	8.525	8.695	8.851	-	-	Continuing	Continuing
• APAF 05 Line Item B00200: <i>B-2A</i>	2.315	0.201	0.206	-	0.206	0.210	0.213	-	-	Continuing	Continuing
• APAF 05 Line Item B01B00: <i>B-1B</i>	0.000	0.000	0.000	-	0.000	0.000	0.000	-	-	Continuing	Continuing
• OPAF 03 Line Item 834010: <i>General Information Technology</i>	0.177	0.180	1.698	-	1.698	1.701	1.731	-	-	Continuing	Continuing

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.

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i>	Project (Number/Name) 655262 / <i>Family of Gateways</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>5th-to-4th Generation Gateway</i>				
5th-to-4th Generation Gateway Development	2	2019	3	2021
<i>Battlefield Airborne Communication Node (BACN)</i>				
BACN	1	2019	4	2019