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

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	39.130	30.540	28.954	-	28.954	-	-	-	-	-	-
EF5: <i>Joint Tactical Network (JTN)</i>	-	14.694	10.327	10.009	-	10.009	-	-	-	-	-	-
EX6: <i>Waveforms</i>	-	24.436	20.213	18.945	-	18.945	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This funding line supports the Army Network Modernization Strategy LOE 1, Unified Network. Efforts are aligned to support the Network-Cross Functional Team capability set approach to achieve the network modernization strategy.

EF5 project: The Joint Enterprise Network Manager (JENM) software provides a single, converged network management tool allowing the Warfighter to plan, configure, load, and manage the Joint Services' Tactical Radios and their networks in the field - a capability not available in legacy planning systems. JENM funding supports several types of tactical radios, such as the Manpack and Rifleman, enabling them to utilize Mobile Ad Hoc Networking (MANET) and other waveforms to include: TrellisWare Scalable Manet (TSM), Warrior Robust Enhanced Network (WREN), Mobile User Objective System (MUOS) waveform, Demand Assigned Multiple Access (DAMA) Satellite Communications (SATCOM), Integrated Waveform (IW), and Single Channel Ground and Airborne Radio System (SINCGARS) waveform. Using its Over-the-Air-Management (OTAM) functionality, JENM provides the Commander the ability to quickly reconfigure critical networks. JENM enhances the S6's ability to conduct Course of Action (COA) Analysis and the Military Decision Making Process (MDMP), providing commanders critical information regarding their ability to communicate.

FY 2022 funding will continue radio planner development efforts to design, engineer, integrate and test of planning and management capabilities for the Tactical Radio network in support of the TSM, and the WREN waveforms. Continued development aligns with the vision to provide further integration of the Integrated Tactical Network (ITN) and Network Management of its emerging systems to enable Soldiers the ability to effectively manage the ITN. Radio planner development efforts will also support MUOS Waveform Planning Continuing System Improvements and rapid provisioning of MUOS end-user terminals, as well as high frequency (HF) Waveform planning in support of HF modernization.

Planning applications are deployed on, and critically tied to the Ruggedized Application Platform - Tactical Radios (RAP-TR) hardware from Division to the Company level.

EX6 project: Product Manager (PdM) Waveforms provides the transport technologies necessary to support the overall connectivity of the Unified Network. PdM Waveforms' technology assessments, integration, and configuration management enable seamless updates and fluid communication between echelons of the Unified Network.

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PdM Waveforms delivers, maintains, and upgrades portable, interoperable, MANET waveforms, Advanced Networking Waveforms (ANWf), and network enterprise services in support of the N-CFT capability set approach to achieve the network modernization strategy.

PdM Waveforms will remain agile to accommodate emerging warfighter needs by addressing the following:

- 1) Waveform (WF) analysis and system engineering activities for DoD as Lead Service Activity for Ground/Line of Sight (LoS) Waveforms (currently TSM, WREN, and SINCGARS) in accordance with Deputy Secretary of Defense memo for Enhancing DoD's Joint Tactical Networks and Datalink Modernization, 29 March 2019
- 2) Development and/or integration efforts of Broadcast Waveforms (i.e. SINCGARS, WREN, ANWf) and Radio Services (i.e. Spectrum Aware Tactical Radio-Dynamic Spectrum Access (SATR-DSA), enterprise Over The Air Management (eOTAM)) in support of Army Network modernization, and agile mission support initiatives
- 3) Viability assessments of ANWf in support of the Integrated Tactical Network (ITN) and future capability sets to ensure waveform performance in advance of formal ITN experimentation and fielding activities

FY 2022 Base RDT&E dollars, in the amount of \$17.809 million, will fund next generation Government developed waveforms and Radio Service applications, system and architectural engineering for ANWf radio communications technologies, program management support and logistics in support of N-CFT Capability Set (CS) for the Unified Network LOE, and examine modular and open system architectures to decrease future integration and waveform porting costs.

In FY 2022, funding in the amount of \$0.211 million for manpower was realigned to Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.

B. Program Change Summary (\$ in Millions)	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022 Base</u>	<u>FY 2022 OCO</u>	<u>FY 2022 Total</u>
Previous President's Budget	40.808	31.696	25.319	-	25.319
Current President's Budget	39.130	30.540	28.954	-	28.954
Total Adjustments	-1.678	-1.156	3.635	-	3.635
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.678	-1.156			
• Adjustments to Budget Years	-	-	3.635	-	3.635

Change Summary Explanation

Fiscal Year 2022 (FY22) increase of \$3.635 million relates to increases in Project EX6 Waveforms commercial waveforms vetting analysis and characterization efforts and support efforts.

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0605031A / Joint Tactical Network (JTN)				Project (Number/Name) EF5 / Joint Tactical Network (JTN)			
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
EF5: Joint Tactical Network (JTN)	-	14.694	10.327	10.009	-	10.009	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

EF5 project: This funding line supports the Army Network Modernization Strategy LOE 1, Unified Network. Efforts are aligned to support the Network-Cross Functional Team capability set approach to achieve the network modernization strategy.

The Joint Enterprise Network Manager (JENM) software provides a single, converged network management tool allowing the Warfighter to plan, configure, load, and manage the Joint Services' Tactical Radios and their networks in the field - a capability not available in legacy planning systems. JENM funding supports several types of tactical radios, such as the Manpack and Rifleman, enabling them to utilize Mobile Ad Hoc Networking (MANET) and other waveforms to include: TrellisWare Scalable Manet (TSM), Warrior Robust Enhanced Network (WREN), Mobile User Objective System (MUOS) waveform, Demand Assigned Multiple Access (DAMA) Satellite Communications (SATCOM), Integrated Waveform (IW), and Single Channel Ground and Airborne Radio System (SINCGARS) waveform. Using its Over-the-Air-Management (OTAM) functionality, JENM provides the Commander the ability to quickly reconfigure critical networks. JENM enhances the S6's ability to conduct Course of Action (COA) Analysis and the Military Decision Making Process (MDMP), providing commanders critical information regarding their ability to communicate.

FY 2022 funding will continue radio planner development efforts to design, engineer, integrate and test of planning and management capabilities for the Tactical Radio network in support of the TSM, and the WREN waveforms. Continued development aligns with the vision to provide further integration of the Integrated Tactical Network (ITN) and Network Management of its emerging systems to enable Soldiers the ability to effectively manage the ITN. Radio planner development efforts will also support MUOS Waveform Planning Continuing System Improvements and rapid provisioning of MUOS end-user terminals, as well as High Frequency (HF) Waveform planning in support of HF modernization.

Planning applications are deployed on, and critically tied to the Ruggedized Application Platform - Tactical Radios (RAP-TR) hardware from Division to the Company level.

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

	FY 2020	FY 2021	FY 2022
Title: JENM Program Office Support	2.950	2.648	2.418
Description: Program Management Office support in the development of the JENM system.			
FY 2021 Plans:			
The JENM program office funding will continue support to JENM design, engineering, integration and test of planning and management capabilities for the Tactical Radio network. The JENM program office supports the vision of integrating lower and mid-tier Network Management capabilities to enable Soldiers to manage their entire consolidated tactical network. Program			

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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EF5 / <i>Joint Tactical Network (JTN)</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
<p>office funding will also support completion of MUOS waveform planning simplification and rapid provisioning of MUOS end-user terminals.</p> <p>FY 2022 Plans: The JENM program office funding will continue support to JENM design, engineering, integration and test of planning and management capabilities for the Tactical Radio network. The JENM program office supports the vision of integrating lower and mid-tier Network Management capabilities to enable Soldiers to manage their entire consolidated tactical network. Program office funding will also support completion of MUOS waveform planning simplification and rapid provisioning of MUOS end-user terminals.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Decrease in JENM Program Office Support is attributed to the completion of JENM V3.5 Requirements and the transition to continuing system improvements and post deployment software support activities.</p>			
<p>Title: JENM Development</p> <p>Description: JENM provides consolidated communications planning, network configuration, network activation, position reporting, fault management, security management, and network health and status reporting needed to establish and maintain a mobile wireless network comprised of SW defined network waveforms. JENM interfaces with other external network managers, mission planning systems, network planning systems, key management systems, and spectrum planning systems. JENM is considered a mission essential system. JENM is also considered a critical element within the Ruggedized Application Platform ? Tactical Radios (RAP-TR) hardware configuration management tool kit.</p> <p>FY 2021 Plans: Development funding will continue design, engineering, integration and test of planning and management application for the Tactical Radio network. Support to align with Army Network Modernization to provide further integration of the lower and mid-tier Network Management with that of PM TN to enable Soldiers the ability to manage the entire, consolidated, tactical network. Development funding will also support completion of MUOS waveform planning simplification and rapid provisioning of MUOS end-user terminals.</p> <p>JENM planning applications are deployed on, and critically tied to the RAP-TR hardware from Division to the Company level.</p> <p>FY 2022 Plans: Development funding will continue design, engineering, integration and test of planning and management application for the Tactical Radio network. Support to align with Army Network Modernization to provide further integration of the lower and mid-tier Network Management with that of PM TN to enable Soldiers the ability to manage the entire, consolidated, tactical network. Development funding will also support completion of MUOS waveform planning simplification and rapid provisioning of MUOS end-user terminals for joint service requirements.</p>	11.744	7.679	7.591

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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EF5 / <i>Joint Tactical Network (JTN)</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
JENM planning applications are deployed on, and critically tied to the RAP-TR hardware from Division to the Company level.			
<i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> Decrease in JENM Development cost is attributed to the completion of JENM V3.5 Requirements and the transition to continuing system improvements and post deployment software support activities.			
Accomplishments/Planned Programs Subtotals	14.694	10.327	10.009

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
• 0605031N: 0605031N; JTN, RDTE,N	2.677	2.705	-	-	-	-	-	-	-	-	-
• 0605031F: 0605031F; JTNC, RDTE,F	3.798	3.844	-	-	-	-	-	-	-	-	-
• B99318: Joint Network Management System	-	3.904	0.930	-	0.930	-	-	-	-	-	-

Remarks
PE 0605031A contains only the JTN (PdM Waveforms and PdM TCNO (JENM)) RDTE funding.

Joint Enterprise Network Manager (JENM) is funded using a Joint budget strategy. Each Military Department (MILDEP) budgets for approximately one-third of the total program RDT&E requirements for joint efforts. Fiscal Year (FY) 2020 to FY 2021 funding reflects the full JENM requirement with the consolidated funding from the other Services, while FY 2022 and beyond reflects the Army one-third portion of total program RDT&E funds. Out-year funding is programmed in PE 0605031A by the Army, PE 0605031N by the Navy and PE 0605031F by the Air Force. USMC funding will be provided on an annual basis via Military Interdepartmental Purchase Request (MIPR). Prior to submission of the President's Budget, the funding from Navy PE 0605031N and Air Force PE 0605031F is consolidated with Army PE 0605031A for execution per OSD direction.

JENM and baseline planning applications are deployed on the RAP-TR hardware from Division to the Company level. JENM Logistics & Training capabilities are captured under the Joint Network Management System OPA-2 line (JNMS B99318) FY21 and out.

D. Acquisition Strategy
Joint Tactical Network Center (JTNC) Acquisition Decision Memorandum (ADM) (July 2012) (JENM Supporting Role). Per the December 2014 Joint Tactical Network (JTN) Select Acquisition Report (SAR), JTN was 90% expended and changed to inactive. Defense Acquisition Management Information Retrieval (DAMIR) reflected the inactive status on 3 June 2015 JTN APB (13 October 2015) (JENM Supporting Role).

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Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
2040 / 5	PE 0605031A / <i>Joint Tactical Network (JTN)</i>	EF5 / <i>Joint Tactical Network (JTN)</i>

Product Manager Tactical Cyber & Network Operations (TCNO) manages a Government Owned, Government Operated (GOGO) Software Development & Integration Facility which employs competitive contracting strategies for software development & sustainment of the network manager components to ensure warfighter access to the best technology and innovative capabilities while addressing emerging threats and future requirements via an affordable, operationally effective, and timely framework.

The Army will continue a radio planner effort that will plan, manage, and provision capabilities for simplified workflow based planning solutions to rapidly meet emerging capability requirements stemming from Network Cross Functional Team (CFT) initiatives and directed requirements.

JENM will support the completion of JENM v3.5 development, which include complete MUOS simplification, upgrades to JENM Public Key Infrastructure (PKI) certificate management, and cyber enhancements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EF5 / <i>Joint Tactical Network (JTN)</i>
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Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JENM Program Management Support	MIPR	Various : Various	4.563	3.078	Nov 2019	2.648	Jan 2021	2.418	Jan 2022	-		2.418	0.000	12.707	-
Subtotal			4.563	3.078		2.648		2.418		-		2.418	0.000	12.707	N/A

Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
JENM NMRIL Development	MIPR	SSC PACIFIC : San Diego, CA	15.369	3.712	Nov 2019	3.073	Jan 2021	3.037	Jan 2022	-		3.037	Continuing	Continuing	Continuing
JENM NMRIL Development SSA	C/CPFF	G2 Software Systems : San Diego, CA	3.337	2.199	Dec 2019	2.002	Jan 2021	1.979	Jan 2022	-		1.979	Continuing	Continuing	-
JENM Radio Planning and Management Enhancement	MIPR	Harris, CodeMettle : Aberdeen, MD	5.435	3.710	Feb 2020	-		-		-		-	Continuing	Continuing	-
JENM NMRIL Development CIT	C/CPFF	BOOZ ALLEN HAMILTON INC. : San Diego, CA	1.975	1.995	Feb 2020	2.604	Jan 2021	2.575	Jan 2022	-		2.575	Continuing	Continuing	Continuing
Subtotal			26.116	11.616		7.679		7.591		-		7.591	Continuing	Continuing	N/A

Project Cost Totals	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
	30.679	14.694	10.327	10.009	-	10.009	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EF5 / <i>Joint Tactical Network (JTN)</i>
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Event Name	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
JENM v3.5 Software Development and Release	[Redacted]				[Redacted]																							
JENM v3.5 Continuing System Improvements					[Redacted]				[Redacted]																			
JENM v3.5 FQT	[Redacted]																											
Next Generation Planner v1.1	[Redacted]																											
Next Generation Planner v1.2	[Redacted]																											
JENM v3.3.2 Sunset					[Redacted]																							
Manpack OT					[Redacted]																							
JENM v3.4 Transition to Sustainment					[Redacted]																							
JENM ATO									[Redacted]																			
JENM v3.4 Sunset													[Redacted]															
JENM v3.5 Transition to Sustainment																	[Redacted]											
JENM v3.5 Sunset																									[Redacted]			

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EF5 / <i>Joint Tactical Network (JTN)</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
JENM v3.5 Software Development and Release	4	2018	2	2021
JENM v3.5 Continuing System Improvements	2	2021	2	2023
JENM v3.5 FQT	2	2020	2	2020
Next Generation Planner v1.0	4	2018	4	2019
Next Generation Planner v1.1	3	2019	4	2020
MUOS MOT&E 1	4	2019	4	2019
Next Generation Planner v1.2	2	2020	2	2021
JENM v3.3.2 Sunset	4	2020	4	2020
Manpack OT	2	2021	2	2021
JENM v3.4 Transition to Sustainment	2	2021	2	2021
JENM ATO	2	2022	2	2022
JENM v3.4 Sunset	4	2022	4	2022
JENM v3.5 Transition to Sustainment	2	2023	2	2023
JENM v3.5 Sunset	4	2026	4	2026

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Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0605031A / Joint Tactical Network (JTN)				Project (Number/Name) EX6 / Waveforms			
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
EX6: Waveforms	-	24.436	20.213	18.945	-	18.945	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This funding line supports the Army Network Modernization Strategy Line Of Effort (LOE) 1, Unified Network. Efforts are aligned to support the Network-Cross Functional Team's (N-CFT) capability set approach to achieve the network modernization strategy.

Product Manager (PdM) Waveforms provides the transport technologies necessary to support the overall connectivity of the Unified Network. PdM Waveforms' technology assessments, integration, and configuration management enable seamless updates and fluid communication between echelons of the Unified Network.

PdM Waveforms delivers, maintains, and upgrades portable, interoperable, Mobile Ad-hoc Networking (MANET) waveforms, Advanced Networking Waveforms (ANWf), and network enterprise services in support of the N-CFT capability set approach to achieve the network modernization strategy.

PdM Waveforms will remain agile to accommodate emerging warfighter needs by addressing the following:

- 1) Waveform (WF) analysis and system engineering activities for DoD as Lead Service Activity for Ground/Line of Sight (LoS) Waveforms (currently TSM), Warrior Robust Enhanced Network (WREN), and Single Channel Ground and Airborne Radio System (SINGARS) in accordance with (IAW) Deputy Secretary of Defense memo for Enhancing DoD's Joint Tactical Networks and Datalink Modernization, 29 March 2019
- 2) Development and/or integration efforts of Broadcast Waveforms (i.e. SINGARS, WREN, ANWf) and Radio Services (i.e. Spectrum Aware Tactical Radio-Dynamic Spectrum Access (SATR-DSA), enterprise Over The Air Management (eOTAM)) in support of Army Network modernization, and agile mission support initiatives
- 3) Viability assessments of ANWf in support of the Integrated Tactical Network (ITN) and future capability sets to ensure waveform performance in advance of formal ITN experimentation and fielding activities

FY 2022 Base RDT&E dollars will fund next generation Government developed waveforms and Radio Service applications, system and architectural engineering for ANWf radio communications technologies, program management support and logistics in support of N-CFT Capability Set (CS) for the Unified Network LOE, and examine modular and open system architectures to decrease future integration and waveform porting costs.

In FY 2022, funding in the amount of \$0.211 million for manpower was realigned to Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.

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

	FY 2020	FY 2021	FY 2022
Title: Program Management Office Support	4.364	2.873	2.662
Description: Waveform matrix and contractor support, including technical, logistics, and business staff oversight			

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
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<i>FY 2021 Plans:</i> Continue Program Management support for PdM Waveforms, including contractors.			
<i>FY 2022 Plans:</i> Funding will provide for matrix and contractor support for Waveforms engineering development, testing, and program oversight			
<i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> Decrease due to realignment from reimbursable civilian funding to direct OMA.			

<i>Title:</i> Waveforms Software Development	12.579	10.385	9.261
<i>Description:</i> PdM Waveforms provides software development and waveforms support for tactical radios operational and networking requirements for the following: 1) Single Channel Ground and Airborne Radio System (SINCGARS) - Develop NexGen SINCGARS waveform to combat the adversary's near, mid, and far-term Electronic Attack/Electronic Warfare (EA/EW) capabilities 2) Warrior Robust Enhanced Network (WREN) Waveform will enhance range, scalability, and Electronic Protection (EP) for a unified transport to Army tactical networks. 3) Spectrum Aware Tactical Radio-Dynamic Spectrum Access (SATR-DSA) for tactical waveforms will mature the capability for efficient spectrum use in a congested Electromagnetic Environment (EME)			
<i>FY 2021 Plans:</i> - Mitigate CEMA threats for SINCGARS/WREN, mitigate interference effects & coordinated EW and communications threats, and develop EW enabled cyber capabilities - Work with Industry Partners to assess, analyze, and vet Advanced Networking Waveforms (ANWf) in support of the Integrated Tactical Network (ITN) and future capability set (CS) - Radio Service capability to simplify the unified network - Single Channel Ground and Airborne Radio System (SINCGARS)/ Warrior Robust Enhanced Network (WREN) will be integrated into ITN/CS 21 - Continue to assess and analyze ANWf in a contested and congested environment to fulfill the capability gap identified by the Network-Cross Functional Team (N-CFT)			
<i>FY 2022 Plans:</i> Funding will support the requirement and initial design development of SINCGARS NexGen, WREN problem fixes and hardening the capability in support of the ITN and CS23. Support will include effort to alleviate Cyber Electro-Magnetic Activities (CEMA) threats for SINCGARS and WREN, including Lead Service activities, develop & integrate EW capabilities, and initiate development and release of SATR-DSA 1 for efficient spectrum use			
<i>FY 2021 to FY 2022 Increase/Decrease Statement:</i>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
Decrease due to a reduction in commercial waveforms support efforts				
<p>Title: Waveforms Test and Evaluation</p> <p>Description: PdM Waveforms performs test and evaluation activities to address interoperability, range, scalability, resiliency, Electronic Warfare (EW)/Cyber Electromagnetic Activities (CEMA), and readiness. Advanced Networking Waveforms (ANWf) assessments support inclusion and/or integration of technologies into Army experimentation and Capability Sets (CS's) Viability and Readiness Assessments including Technology Readiness Level (TRL) assessment, test and evaluation of EW and cyber capabilities in support of Integrated Tactical Network (ITN), performance and behavior analysis of waveforms against topologies, architectures, operational use cases as defined by Network-Cross Functional Team (N-CFT) and fielding activities</p> <p>FY 2021 Plans: Conduct test and evaluation procedures for continued code development and detect fixes of Government-owned waveforms and perform evaluation and characteristics analysis of commercial waveforms for potential Government utilization to meet warfighter requirements.</p> <p>FY 2022 Plans: Funding will validate initial design and system engineering activities of the NexGen of Single Channel Ground and Airborne Radio System (SINCGARS), validate and test the enhancements and problem fixes of the Warrior Robust Enhanced Network (WREN) waveforms, validate implementation of enterprise Over The Air Management (eOTAM) 2.1, performance characterization and analysis of waveforms to meet the warfighter's requirements, and validate and test Spectrum Aware Tactical Radio-Dynamic Spectrum Access (SATR-DSA) Release 1</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Increase due to additional testing support</p>		4.833	5.126	5.221
<p>Title: Waveforms Software Support and System Engineering</p> <p>Description: PdM Waveforms software support and systems engineering for waveforms and network manager applications provides the following: 1) Radio Services applications that enable over-the-air (OTA) NSA cryptographic key, radio and network configuration tools and bandwidth efficient OTA protocols supporting the Unified Network Line of Effort (LOE) for CSs 2) eOTAM will enhance radio health services, Common Management Information Base (MIB) integration, integration with Army network management systems and comply with NSA security standards 3) Evaluate the Technology Readiness Level (TRL) of ANWf in support of the ITN, N-CFT and CS' requirements and architectures 4) Oversight and inform policy for SINCGARS, WREN, TSM, eOTAM, and related products for DoD, including Lead Service activities</p>		2.660	1.829	1.801

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army	Date: May 2021
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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EX6 / <i>Waveforms</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
<p><i>FY 2021 Plans:</i> Continue software support and systems engineering efforts as described above in support of PdM Waveforms.</p> <p><i>FY 2022 Plans:</i> Funding will support radio services software, product enhancement, and systems engineering & integration (SE&I) as described above in support of PdM Waveforms. Support will include: release of enterprise Over The Air Management (eOTAM) 2.1; Lead Service activities for the integration of existing and emerging waveforms in the DoD; analysis of TSM capabilities for Warrior Robust Enhanced Network (WREN) integration and release to DoD; and NATO and ABCANZ ensuring interoperability between the US and Coalition partners, including Lead Service activities</p> <p><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> Decrease due to a reduction in commercial waveforms vetting analysis and characterization efforts</p>			
Accomplishments/Planned Programs Subtotals	24.436	20.213	18.945

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

Remarks

D. Acquisition Strategy
PdM Waveforms is responsible for core activities, including; developing and updating legacy waveforms and analyzing Advance Networking Waveforms (ANWf) that operate on multiple radio sets and in all operational environments that support network-centric operational warfare. Waveform developments (upgrading, developing, and maintaining) will generally be procured through full and open contract competitions.

While maintaining legacy networking waveforms, PdM Waveforms implemented a strategy which focuses on vetting and analyzing ANWf. The product office continues to establish working relationships with industry partners within the waveform market. The strategy consists of conducting initial analysis of commercial waveforms, documenting vulnerabilities, identifying implementation strategies, and making recommendations to senior leadership on potential Army use cases.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021			
Appropriation/Budget Activity						R-1 Program Element (Number/Name)				Project (Number/Name)					
2040 / 5						PE 0605031A / Joint Tactical Network (JTN)				EX6 / Waveforms					
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Program Management Support - Matrix	MIPR	C5ISR Center : APG, MD	2.813	1.486	Jan 2020	1.051	Jan 2021	0.804	Jan 2022	-		0.804	Continuing	Continuing	Continuing
Program Management Support - SETA	C/CPFF	SEV1-Tech : Woodbridge, VA	4.119	2.878	Nov 2019	1.822	Nov 2020	1.858	Nov 2021	-		1.858	Continuing	Continuing	Continuing
Subtotal			6.932	4.364		2.873		2.662		-		2.662	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Software Development - C5ISR Center	MIPR	C5ISR Center : APG, MD	17.386	11.855	Nov 2019	9.135		7.986	Nov 2021	-		7.986	Continuing	Continuing	Continuing
Software Development - Technical/Coding (MA-IDIQ)	C/CPAF	MA - IDIQ : Various Locations	17.658	0.724	Jan 2020	1.250		1.275	Dec 2021	-		1.275	Continuing	Continuing	Continuing
Subtotal			35.044	12.579		10.385		9.261		-		9.261	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Systems Engineering - SSC NIWC	MIPR	SSC LANT/PAC : Charleston, SC; San Diego, CA	1.479	0.209	Dec 2019	0.460		0.560	Dec 2021	-		0.560	Continuing	Continuing	-
Software Support - WREN	MIPR	C5ISR Center : APG, MD	2.173	2.451	Nov 2019	1.369		1.241	Nov 2021	-		1.241	Continuing	Continuing	Continuing
Subtotal			3.652	2.660		1.829		1.801		-		1.801	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EX6 / <i>Waveforms</i>
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Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test and Evaluation - C5ISR Center	MIPR	C5ISR Center : APG, MD	4.205	4.833	Mar 2020	5.126		4.711	Feb 2022	-		4.711	Continuing	Continuing	Continuing
Test and Evaluation - NATO	MIPR	RAND : Arlington, VA	0.490	-		-		0.510	Jun 2022	-		0.510	Continuing	Continuing	Continuing
Subtotal			4.695	4.833		5.126		5.221		-		5.221	Continuing	Continuing	N/A
Project Cost Totals			50.323	24.436		20.213		18.945		-		18.945	Continuing	Continuing	N/A

Remarks
 FY 2021 and out reflect a reduction in reimbursable manpower as a result of a realignment of matrixed business management support from Army Material Command, to direct funded Operations and Maintenance.

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army **Date: May 2021**

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EX6 / <i>Waveforms</i>
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Event Name	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	
SINGGARS 3.1 Waveform					▲ 3 SINC 3.1 Release																								
SINGGARS NexGen Waveform Development									■ SINC NexGen Development																				
SINGGARS NexGen Waveform Problem Report (PR) Fixes																	■ SINC NexGen PR fixes												
SINGGARS NexGen Waveform																									▲ 13 SINC NexGen Release				
Warrior Robust Enhanced Network (WREN) C5ISR Transition					▲ 1 WREN Transition to PdM Waveforms																								
Warrior Robust Enhanced Network (WREN) PR Fixes									■ WREN Hardening, Minor Enhancements, PR Fixes																				
Warrior Robust Enhanced Network (WREN) A													▲ 7 WREN Release A																
Warrior Robust Enhanced Network (WREN) B													■ WREN Release B Development																
Warrior Robust Enhanced Network (WREN) B PR Fixes																					■ WREN Hardening, Enhancements, PR Fixes								
Enterprise Over The Air Management (eOTAM) 2.0					▲ 2 eOTAM 2.0 Release																								
Enterprise Over The Air Management (eOTAM) 2.1													▲ 5 eOTAM 2.1 Release																
Enterprise Over The Air Management (eOTAM) 2.2																													
Enterprise Over The Air Management (eOTAM) 2.3																													

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0605031A / <i>Joint Tactical Network (JTN)</i>	Project (Number/Name) EX6 / <i>Waveforms</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SINCGARS 3.1 Waveform	2	2021	2	2021
SINCGARS NexGen Waveform Development	4	2021	3	2024
SINCGARS NexGen Waveform Problem Report (PR) Fixes	4	2024	3	2025
SINCGARS NexGen Waveform	4	2025	4	2025
Warrior Robust Enhanced Network (WREN) C5ISR Transition	4	2020	4	2020
Warrior Robust Enhanced Network (WREN) PR Fixes	1	2021	4	2022
Warrior Robust Enhanced Network (WREN) A	1	2023	1	2023
Warrior Robust Enhanced Network (WREN) B	1	2023	2	2025
Warrior Robust Enhanced Network (WREN) B PR Fixes	3	2025	1	2027
Enterprise Over The Air Management (eOTAM) 2.0	1	2021	1	2021
Enterprise Over The Air Management (eOTAM) 2.1	4	2022	4	2022
Enterprise Over The Air Management (eOTAM) 2.2	4	2023	4	2023
Enterprise Over The Air Management (eOTAM) 2.3	4	2024	4	2024
Enterprise Over The Air Management (eOTAM) 2.4	4	2025	4	2025
Enterprise Over The Air Management (eOTAM) 2.5	4	2026	4	2026
Dynamic Spectrum Access (DSA) SSC NIWC Transition	2	2021	2	2021
Dynamic Spectrum Access (DSA) Release 1	1	2023	1	2023
Dynamic Spectrum Access (DSA) Release 2	1	2024	1	2024
Dynamic Spectrum Access (DSA) Release 3	1	2025	1	2025
Dynamic Spectrum Access (DSA) Release 4	1	2026	1	2026
Dynamic Spectrum Access (DSA) Release 5	1	2027	1	2027
Advanced Networking Waveforms (ANWf) Analysis	1	2021	4	2026
MA/IDIQ - Contract Award	4	2018	4	2028