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

<b>Appropriation/Budget Activity</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army / BA 7: Operational Systems Development</i>					<b>R-1 Program Element (Number/Name)</b> PE 0303142A / <i>SATCOM Ground Environment (SPACE)</i>							
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	-	0.000	0.000	18.684	-	18.684	21.707	16.967	15.282	14.602	Continuing	Continuing
253: <i>Dscs-Dcs (Phase II)</i>	-	0.000	0.000	4.372	-	4.372	4.495	4.556	4.565	4.885	Continuing	Continuing
456: <i>MILSATCOM System Engineering</i>	-	0.000	0.000	14.312	-	14.312	17.212	12.411	10.717	9.717	0.000	64.369

**Note**

This is not a new start.

SATCOM Ground Environment (SPACE) funding has been realigned to 0303142A from 1203142A in FY 2021 and out.

**A. Mission Description and Budget Item Justification**

Project 253, Dscs-Dcs (Phase II), SATCOM Ground Environment (SPACE) supports the Army's Network Modernization Strategy Line of Effort (LOE) 1 - Unified Network. Efforts are aligned to support the Network-Cross Functional Team capability set approach to achieve the network modernization strategy.

FY 2021 Base funding in the amount of \$4.376 million develops Satellite Communication (SATCOM) ground subsystem equipment and software in support of Joint Chiefs of Staff (JCS) validated Mission Command Network and Systems requirements for the worldwide Defense Enterprise Wideband SATCOM System (DEWSS). DEWSS is composed of the Super High Frequency (SHF) Defense Satellite Communications System (DSCS) and Wideband Global SATCOM (WGS) programs, which are required to support legacy, interim and emerging communication space architectures and future force requirements. Expansion of the WGS constellation and upgrades to both DSCS and WGS are vital to support the Army's emerging power projection and rapid deployment role. DSCS and WGS provide multiple channels of tactical end-to-end connectivity and interoperability with strategic networks and national decision-makers, satisfying JCS network operations in support of the President, JCS, combatant commanders, military departments, Department of State and other government departments and agencies.

Project 456, MILSATCOM System Engineering 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.

456 - MILSATCOM System Engineering assures the tactical Army satellite communications (SATCOM) and SATCOM On-the-Move (SOTM) systems are engineered to legally and efficiently operate worldwide. MILSATCOM System Engineering shapes Joint SATCOM systems' design efforts, standards development and planning processes. MILSATCOM System Engineering represents the Army's tactical interests within DoD, Commercial and International forums to ensure affordable and scalable future SATCOM capabilities for maneuver forces. These efforts ensure that the Army continues to evaluate evolving technologies for the planning and designing of SATCOM solutions that reduce technical and programmatic impacts.

Project 456 also includes Protected Anti-jam Tactical SATCOM efforts, which fill a critical communications gap for anti-jam SATCOM capability for mobile ground forces conducting expeditionary operations in electronically contested environments. It provides the ability for the tactical Army to be resilient in a contested environment and

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<b>Appropriation/Budget Activity</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army / BA 7: Operational Systems Development</i>	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / <i>SATCOM Ground Environment (SPACE)</i>
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protect against catastrophic loss of situational awareness and command and control during critical battle movement. It will offer the tactical Army protection against interference that is either intentional or unintentional. These efforts are synchronized with the Air Force and DoD's plans for Protected Tactical Waveforms (PTW) on Wideband Global SATCOM (WGS), the Protected Tactical Satellite (PTS), and commercial SATCOM systems.

Protected Anti-jam Tactical SATCOM is a continuation of efforts previously funded under the MILSATCOM System Engineering (1203142A/FE2) and Protected Anti-jam Tactical SATCOM (1203142A/FI8) lines. MILSATCOM System Engineering supported development and testing of prototype PTW modems during the Protected Tactical Service Field Demo (PTSFD) in FY 2019. Protected Tactical Anti-jam SATCOM supported initial development, testing and certification of production representative PTW modems, incorporating Army specific requirements, to support continued spiral development of critical protected communications capabilities to address resiliency in jamming environments in FY 2020.

FY 2021 funding supports the systems engineering required to support technology maturation, systems analysis, and planning associated with Joint SATCOM development efforts. This line continues to fund the systems architecture and analysis for current and future SATCOM efforts in both wideband and protected satellite communications. This effort includes collaborative work with the Air Force on the prototype Protected Tactical Waveform (PTW) modem development and testing during the Protected Tactical Service Field Demo (PTSFD). It also funds system engineering efforts the Protected Tactical Enterprise Service (PTES) program which will test the PTW modem over Wideband Global SATCOM (WGS) as well as Protected Tactical SATCOM (PTS), which is the next generation satellite constellation. Funding includes the Network Centric Waveform Tool (NCWT) development and testing and other efforts that have impacts on tactical Army use of military and commercial satellite constellations.

FY 2021 funding also supports continued collaborative development, testing and certification with the Air Force of critical protected tactical capabilities.

MILSATCOM System Engineering (0303142A/456) funding is a realignment of funding from MILSACTOM System Engineering (1203142A/FE2) and Protected Anti-jam Tactical SATCOM (1203142A/FI8).

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	18.684	-	18.684
Total Adjustments	0.000	0.000	18.684	-	18.684
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	18.684	-	18.684

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2021 Army		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army / BA 7: Operational Systems Development</i>	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / <i>SATCOM Ground Environment (SPACE)</i>	
<b><u>Change Summary Explanation</u></b> FY 2021 increase reflects funding realignment from SATCOM Ground Environment (SPACE) (1203142A).  Project 253, Dscs-Dcs (Phase II), SATCOM Ground Environment (SPACE): In FY 2021, \$1.241 million in Reimbursable Manpower for this line has been realigned from Reimbursable Civilian Funding to Direct Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.		

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

<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)
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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
253: Dscs-Dcs (Phase II)	-	0.000	0.000	4.372	-	4.372	4.495	4.556	4.565	4.885	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

1203142A - SATCOM Ground Environment (SPACE) funding has been realigned to 0303142A SATCOM Ground Environment (SPACE) in FY 2021 and out. This is not a new start.

**A. Mission Description and Budget Item Justification**

Project 253, Dscs-Dcs (Phase II), SATCOM Ground Environment (SPACE) supports the Army's Network Modernization Strategy Line of Effort (LOE) 1 - Unified Network. Efforts are aligned to support the Network-Cross Functional Team capability set approach to achieve the network modernization strategy.

FY 2021 Base funding in the amount of \$4.372 million develops Satellite Communication (SATCOM) ground subsystem equipment and software in support of Joint Chiefs of Staff (JCS) validated Mission Command Network and Systems requirements for the worldwide Defense Enterprise Wideband SATCOM System (DEWSS). DEWSS is composed of the Super High Frequency (SHF) Defense Satellite Communications System (DSCS) and Wideband Global SATCOM (WGS) programs, which are required to support legacy, interim and emerging communication space architectures and future force requirements. Expansion of the WGS constellation and upgrades to both DSCS and WGS are vital to support the Army's emerging power projection and rapid deployment role. DSCS and WGS provide multiple channels of tactical end-to-end connectivity and interoperability with strategic networks and national decision-makers, satisfying JCS network operations in support of the President, JCS, combatant commanders, military departments, Department of State and other government departments and agencies.

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

	FY 2019	FY 2020	FY 2021
<b>Title:</b> SATCOM Terminal Digital Intermediate Frequency Implementation Analysis	-	-	2.301
<b>Description:</b> SATCOM Terminal Digital Intermediate Frequency (IF) implementation analysis aimed at improving bandwidth efficiency of gateway terminals while providing an additional layer of resiliency through terminal redundancy. These analyses include various evaluations for digital terminal components to replace current, less efficient, analog components. These analyses also include assessment of terrestrial connectivity among SATCOM terminals to enable Continuity Of Operations (COOP) and failover scenarios required for resiliency.			
<b>FY 2021 Plans:</b> Continue to demonstrate SATCOM Gateway resiliency through path diversity; use SATCOM terminals at different geographical locations to support any SATCOM mission.			
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Army		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
Funding has been realigned from 1203142A - SATCOM Ground Environment (SPACE) to 0303142A SATCOM Ground Environment (SPACE) in FY 2021 and out.			
<b>Title:</b> Electromagnetic Interference Mitigation Analysis	-	-	2.071
<b>Description:</b> Continue to assess multiple interference mitigation/cancellation technologies for effectiveness in improving reliability/resiliency of strategic and tactical communications. Mature technology to software/firmware that will improve protected SATCOM modem/terminal performance in a electro-magnetic interference contested environment. Technology will also improve terminal performance against adversary and friendly satellite link jamming resources.			
<b>FY 2021 Plans:</b> Continue to transition performance specifications to be implemented into next generation SATCOM modem. Mature and demonstrate gateway resiliency by using satellite links and terrestrial connectivity simultaneously to support SATCOM missions.			
<b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Funding has been realigned from 1203142A - SATCOM Ground Environment (SPACE) to 0303142A SATCOM Ground Environment (SPACE) in FY 2021 and out.			
<b>Accomplishments/Planned Programs Subtotals</b>	-	-	4.372

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• BB8500: Defense Enterprise Wideband Satcom Systems	96.633	98.399	101.498	-	101.498	110.890	105.871	101.438	97.156	Continuing	Continuing

**Remarks**  
In FY 2021, \$1.241 million in Reimbursable Manpower for this line has been realigned from Reimbursable Civilian Funding to Direct Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.

**D. Acquisition Strategy**  
This finances Project Manager, Defense Communications and Army Transmission Systems (PM DCATS) netcentric systems engineering, modem risk mitigation, and risk management framework support. Funding provides for SATCOM terminal upgrades, enhancement of baseband throughput capabilities, technology insertion and upgrades which improves SATCOM gateway resiliency while allowing for full utilization of Wideband Global SATCOM (WGS) capabilities. Both the Wideband SATCOM Operational Management System (WSOMS) and the Enterprise Wideband SATCOM Terminal System (EWSTS) Capability Production Documents (CPDs) contain Netcentric-Ready Key Performance Parameters (NR-KPPs) as required by CJCSI 6212.01C. Netcentric efforts are required to facilitate the migration from the current trunk-based communications systems to Internet Protocol (IP) based systems and to engineer, test and integrate IP based capabilities into WSOMS and EWSTS

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Army		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)

systems. Studies, risk mitigation, system integration and advanced demonstrations for Netcentric baseband and policy based control will accommodate technology insertion, data sharing, remote operations, architecture efforts and use of commercial technology, thus ensuring the life of the Defense Enterprise Wideband Satellite System (DEWSS) terminal family beyond 2025 and reducing lifecycle costs and enterprise requirements on the WGS and Defense Satellite Communication System (DSCS) satellites in the future. Contracting approach for new technology is through the use of Broad Agency Announcements (BAA) and Other Transaction Authority (OTA) contracts.

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

<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
SATCOM Terminal Digital IF Implementation Analysis	MIPR	Aberdeen Proving Ground : MD	-	-		-		1.970	Jan 2021	-		1.970	Continuing	Continuing	Continuing
Electromagnetic Interference Mitigation Analysis	MIPR	Aberdeen Proving Ground : MD	-	-		-		1.741	Jan 2021	-		1.741	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	-		-		3.711		-		3.711	Continuing	Continuing	N/A

<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
In-house Support	Allot	PdM WESS : Ft. Belvoir, VA	-	-		-		0.060		-		0.060	Continuing	Continuing	Continuing
Contractor Support	C/CPFF	ACC : Rock Island, IL	-	-		-		0.601	Jan 2021	-		0.601	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	-		-		0.661		-		0.661	Continuing	Continuing	N/A

<b>Project Cost Totals</b>	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	-	0.000	4.372	-	4.372	Continuing	Continuing	N/A

**Remarks**  
 There are no Digital IF transitions in FY21, only demonstrations.

SATCOM Terminal Digital Intermediate Frequency (IF) demonstrations with multi-vendor equipment will be conducted using live satellite links between Tobyhanna Army Depot (TYAD) and Joint SATCOM Engineering Center (JSEC) at Aberdeen Proving Grounds. All components demonstrated will be at Technology Readiness Level (TRL) 6.

Electromagnetic Interference Algorithms at TRL 6 will be hosted on a stand-alone hardware platform and tested at JSEC using live satellite links. All verified algorithms and performance specifications will transition to the Next Generation Frequency Division Multiple Access (FDMA) modem program during 4Q FY 2021.

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2021 Army</b>			<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)	

Event Name	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
SATCOM Terminal Digital Intermediate Frequency (IF) Implementation Analysis																												
Electromagnetic Interference Mitigation Analysis																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Army		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 253 / Dscs-Dcs (Phase II)

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SATCOM Terminal Digital Intermediate Frequency (IF) Implementation Analysis	1	2021	4	2025
Electromagnetic Interference Mitigation Analysis	1	2021	4	2025

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Army										<b>Date:</b> February 2020		
<b>Appropriation/Budget Activity</b> 2040 / 7					<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)				<b>Project (Number/Name)</b> 456 / MILSATCOM System Engineering			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021 Base</b>	<b>FY 2021 OCO</b>	<b>FY 2021 Total</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
456: MILSATCOM System Engineering	-	0.000	0.000	14.312	-	14.312	17.212	12.411	10.717	9.717	0.000	64.369
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

This is not a new start program.

Military Satellite Communications (MILSATCOM) System Engineering (0303142A/456) is a continuation of efforts previously funded by the Army under PE 1203142A - SATCOM Ground Environment (SPACE) MILSATCOM System Engineering (FE2) and Protected Anti-jam Tactical SATCOM (FI8).

Previous funds under MILSATCOM Systems Engineering (1203142A/FE2) supported development and testing of prototype Protected Tactical Waveform (PTW) modems and Protected Tactical Satellites (PTS) during the Protected Tactical Service Field Demo (PTSFD) (FY 2019).

Previous funds under the Protected Anti-jam Tactical SATCOM (1203142A/FI8) supported initial development, testing, and certification of production representative PTW modems, incorporating the Army specific requirements to support continued spiral development of critical protected communications capabilities to address resiliency in jamming environments.

**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.

MILSATCOM System Engineering assures the tactical Army satellite communications (SATCOM) and SATCOM On-the-Move (SOTM) systems are engineered to legally and efficiently operate worldwide. MILSATCOM System Engineering shapes Joint SATCOM systems' design efforts, standards development and planning processes. MILSATCOM System Engineering represents the Army's tactical interests within DoD, Commercial and International forums to ensure affordable and scalable future SATCOM capabilities for maneuver forces. These efforts ensure that the Army continues to evaluate evolving technologies for the planning and designing of SATCOM solutions that reduce technical and programmatic impacts.

MILSATCOM System Engineering includes Protected Anti-jam Tactical SATCOM efforts, which fill a critical communications gap for anti-jam SATCOM capability for mobile ground forces conducting expeditionary operations in electronically contested environments. It provides the ability for the tactical Army to be resilient in a contested environment and protect against catastrophic loss of situational awareness and command and control during critical battle movement. It will offer the tactical Army protection against interference that is either intentional or unintentional. These efforts are synchronized with the Air Force and DoD's plans for Protected Tactical Waveforms (PTW) on Wideband Global SATCOM (WGS), the Protected Tactical Satellite (PTS), and commercial SATCOM systems.

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Protected Anti-jam Tactical SATCOM is a continuation of efforts previously funded under the MILSATCOM System Engineering (1203142A/FE2) and Protected Anti-jam Tactical SATCOM (1203142A/FI8) lines. MILSATCOM System Engineering supported development and testing of prototype PTW modems during the Protected Tactical Service Field Demo (PTSFD) in FY 2019. Protected Tactical Anti-jam SATCOM supported initial development, testing and certification of production representative PTW modems, incorporating Army specific requirements, to support continued spiral development of critical protected communications capabilities to address resiliency in jamming environments in FY 2020.

FY 2021 funding supports the systems engineering required to support technology maturation, systems analysis, and planning associated with Joint SATCOM development efforts. This line continues to fund the systems architecture and analysis for current and future SATCOM efforts in both wideband and protected satellite communications. This effort includes collaborative work with the Air Force on the prototype Protected Tactical Waveform (PTW) modem development and testing during the Protected Tactical Service Field Demo (PTSFD). It also funds the system engineering efforts associated with the Protected Tactical Enterprise Service (PTES) program, which will develop, test, and enable PTW communications over Wideband Global SATCOM (WGS) as well as Protected Tactical SATCOM (PTS), which is the next generation satellite constellation.

FY 2021 funding also supports continued collaborative development, testing and certification with the Air Force of critical protected tactical capabilities.

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

	FY 2019	FY 2020	FY 2021
<p><b>Title:</b> Protected communications system engineering and WGS communications</p> <p><b>Description:</b> Provides systems engineering support relating to the technology maturation, development and planning associated with joint SATCOM development efforts including Network Centric Waveform Tool (NCWT), Protected Tactical Field Service Demo (PTSFD), Protected Tactical Enterprise Service (PTES) and Protected Tactical SATCOM (PTS).</p> <p><b>FY 2021 Plans:</b> Funding supports continued systems engineering and analysis for Protected Communications and WGS Communications, as well as development and technology maturation on the NCWT.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase in FY 2021 of \$1.174 million realigns program funding from MILSATCOM System Engineering (1203142A/FE2) to MILSATCOM System Engineering (0303142A/456) beginning in FY 2021.</p>	-	-	1.174
<p><b>Title:</b> Systems architecture and analysis support</p> <p><b>Description:</b> Provides systems engineering support relating to the architecture and analysis of NCWT and the collaborative SATCOM PTSFD, PTES, and PTS efforts as well as other efforts, such as Analysis of Alternatives and bandwidth studies, that have impact on tactical Army use of military and commercial satellite constellations.</p> <p>These efforts have direct impact in reducing technical programmatic risk for the acquisition efforts for tactical Army SATCOM systems using the WGS and Protected constellations.</p>	-	-	2.619

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>
<p><b>FY 2021 Plans:</b> Funding supports continued in house engineering support, contractor support and system architecture and analysis.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase in FY 2021 of \$2.619 million realigns program funding from the MILSATCOM System Engineering (1203142A/FE2) to the MILSATCOM System Engineering (0303142A/456) beginning in FY 2021.</p>			
<p><b>Title:</b> Testing and certification of critical SATCOM and SATCOM On-the-Move communication and network technologies</p> <p><b>Description:</b> Provides testing and certification of the prototype Protected Tactical Waveform (PTW) modem developed during the PTSFD.</p> <p><b>FY 2021 Plans:</b> Funding supports continued testing and certification of critical SATCOM and SOTM communication and network technologies.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase in FY 2021 of \$.557 million realigns program funding from MILSATCOM System Engineering (1203142A/FE2) to MILSATCOM System Engineering (0303142A/456).</p>	-	-	0.557
<p><b>Title:</b> Protected Tactical Waveform (PTW) Modem Development</p> <p><b>Description:</b> Development of a large form factor and small form factor Protected Tactical Waveform (PTW) modems incorporating Army specific requirements.</p> <p><b>FY 2021 Plans:</b> Funding supports development and engineering of Army specific requirements for the PTW modem that will be utilized for protected tactical communications.</p> <p><b>FY 2020 to FY 2021 Increase/Decrease Statement:</b> Increase in FY 2021 of \$9.962 million realigns program funding from Protected Anti-jam Tactical SATCOM (1203142A/FI8) to MILSATCOM System Engineering (0303142A/456).</p>	-	-	9.962
<b>Accomplishments/Planned Programs Subtotals</b>	-	-	14.312

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

N/A

**Remarks**

FY2020 and prior year funding was aligned to 1203142A/FE2 and 1203142A/FI8

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2021 Army		<b>Date:</b> February 2020
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**D. Acquisition Strategy**

MILSATCOM System Engineering provides advanced systems engineering, research, development, test and evaluation (RDTE) of new and emerging technologies to optimize terminal performance and communications control. Once the technologies are mature and deemed feasible, funding and management responsibility for implementation of the technology will transition to PM Tactical Network and related Programs of Record.

Additionally, MILSATCOM System Engineering will provide RDTE of emerging protected SATCOM technologies to provide resilience and anti-jam protection against electronic warfare (EW), to include denial of geolocation transmissions, secure classified communications in a jamming environment, and a Protected Tactical Waveform (PTW). The program will leverage contracts established by the Air Force beginning in FY 2020.

FY 2021 contract award will support the continued development, testing and certification of a production representative large form factor PTW modem and development. Early development of PTW modems will enable Army preparedness to meet the Air Force's Protected Tactical Enterprise Service (PTES) Initial Operational Capability (IOC) planned for FY 2023.

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

<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 456 / MILSATCOM System Engineering
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<b>Product Development (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Protected Communications and WGS Communications	TBD	Various : APG, MD	-	-		-		1.174	Jul 2021	-		1.174	0.000	1.174	-
Protected Tactical Waveform (PTW) Modem Development	C/IDDQ	To Be Determined : To Be Determined	-	-		-		9.962	Jun 2021	-		9.962	0.000	9.962	-
<b>Subtotal</b>			-	-		-		11.136		-		11.136	0.000	11.136	N/A

**Remarks**  
Leveraging Air Force competitive Indefinite Delivery Indefinite Quantity (IDIQ) contracts to support PTW modem development, engineering, and testing.

<b>Support (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Engineering (In House)	MIPR	PM WIN-T : APG, MD	-	-		-		1.202	Dec 2020	-		1.202	0.000	1.202	-
Engineering Contractor Support	C/CPFF	PM WIN-T : APG, MD	-	-		-		1.190	Oct 2020	-		1.190	0.000	1.190	-
System Architecture and Analysis	MIPR	CERDEC : APG, MD	-	-		-		0.227	Dec 2020	-		0.227	0.000	0.227	-
<b>Subtotal</b>			-	-		-		2.619		-		2.619	0.000	2.619	N/A

<b>Test and Evaluation (\$ in Millions)</b>				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Terminal testing & evaluation system engineering	FFRDC	PEO C3T : Various	-	-		-		0.197	Oct 2020	-		0.197	0.000	0.197	-
Test Support	MIPR	CERDEC : APG, MD	-	-		-		0.161	Dec 2020	-		0.161	0.000	0.161	-
Testing, Certification	MIPR	CERDEC : APG, MD	-	-		-		0.199	Dec 2020	-		0.199	0.000	0.199	-

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

<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 456 / MILSATCOM System Engineering
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
<b>Subtotal</b>			-	-		-		0.557		-		0.557	0.000	0.557	N/A
<b>Project Cost Totals</b>			-	-		0.000		14.312		-		14.312	0.000	14.312	N/A

**Remarks**  
FY 2021 funding is a realignment from MILSATCOM System Engineering (1203142A/FE2) and Protected Anti-jam Tactical SATCOM (1203142A/FI8).

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2021 Army</b>		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 456 / MILSATCOM System Engineering

Event Name	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
Protected Tactical Service Field Demo (PTSFD)																												
Protected Tactical Service Field Demo (PTSFD) Prototype Modem Testing																												
Protected Tactical Enterprise Service (PTES) Development																												
Protected Tactical SATCOM (PTS) Development																												
Network Centric Waveform Tool (NCWT) Development and Testing																												
SATCOM Systems Architecture and Analysis																												
Protected Tactical Waveform (PTW) Modem (Large Form Factor) Development																												
Protected Tactical Waveform (PTW) Modem (Large Form Factor) Testing																												
Protected Tactical Waveform (PTW) Modem (Small Form Factor) Development																												
Protected Tactical Waveform (PTW) Modem (Small Form Factor) Testing																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2021 Army		<b>Date:</b> February 2020
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0303142A / SATCOM Ground Environment (SPACE)	<b>Project (Number/Name)</b> 456 / MILSATCOM System Engineering

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Protected Tactical Service Field Demo (PTSFD)	1	2021	1	2022
Protected Tactical Service Field Demo (PTSFD) Prototype Modem Testing	1	2021	1	2021
Protected Tactical Enterprise Service (PTES) Development	1	2021	4	2025
Protected Tactical SATCOM (PTS) Development	1	2021	4	2025
Network Centric Waveform Tool (NCWT) Development and Testing	1	2021	4	2025
SATCOM Systems Architecture and Analysis	1	2021	4	2025
Protected Tactical Waveform (PTW) Modem (Large Form Factor) Development	1	2021	4	2022
Protected Tactical Waveform (PTW) Modem (Large Form Factor) Testing	3	2022	4	2025
Protected Tactical Waveform (PTW) Modem (Small Form Factor) Development	3	2022	2	2025
Protected Tactical Waveform (PTW) Modem (Small Form Factor) Testing	3	2023	4	2026