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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>					R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	190.385	212.373	43.502	-	43.502	24.944	7.068	1.228	3.405	Continuing	Continuing
126: <i>PEO Electronic Protect</i>	-	0.000	0.000	27.925	-	27.925	15.634	4.153	0.000	0.000	0.000	47.712
146: <i>Air & Msl Defense Planning Control Sys</i>	-	23.335	24.296	14.300	-	14.300	8.401	2.915	1.228	3.405	Continuing	Continuing
149: <i>Counter-Rockets, Artillery & Mortar</i>	-	17.250	14.844	1.277	-	1.277	0.909	0.000	0.000	0.000	Continuing	Continuing
FG5: <i>Counter Unmanned Aerial Systems (UAS)</i>	-	149.800	173.233	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	323.033

Note

ALPS was previously funded under PE 0603327A.

A. Mission Description and Budget Item Justification

Army Long-Range Persistent Surveillance (ALPS) is a passive sensor that provides long range surveillance against Cruise Missile (CM), Fixed Wing (FW), Rotary Wing (RW), and Unmanned Aircraft System (UAS) threats. Prototype systems will be provided to meet multiple Combatant Command identified operational needs and to conduct an assessment. The objectives of this effort are to provide component and subsystem maturity in a system-of-systems environment and to reduce subsequent integration risk. This program will also integrate ALPS to support the Army Integrated Air and Missile Defense (AIAMD) architecture.

The Air and Missile Defense Planning and Control System (AMDPCS) provides integration of air and missile defense operations at all echelon. Specifically, Air and Missile Defense Workstation (AMDWS) provides a correlated air picture using local radars, allowing the Commander the visibility and situational understanding of airspace; other automated defense design and staff planning tools in AMDWS afford Soldiers horizontal and vertical collaborative planning with adjacent units. Air Defense System Integrator (ADSI) serves as a joint tactical data link gateway/air picture, and when correlated by Forward Area Air Defense Command and Control (FAAD C2) and displayed on AMDWS, provides a near-real time, three dimensional joint air picture for the Commander. Joint Tactical Terminal (JTT) provides Soldiers theater ballistic missile (TBM) early warning, allowing them to take appropriate actions. AMDPCS is fielded to Army air and missile defense commands (AAMDC), air defense artillery brigades (ADA BDE), air and missile defense battalions (AMD BN), and Terminal High Altitude Area Air Defense batteries (THAAD BTRY). Air Defense Airspace Management (ADAM), a variant of AMDPCS with similar capabilities, is fielded to corps, divisions, brigade combat teams (BCT), and multi-functional support brigades. As part of capability and technology reuse, AMDWS and FAAD C2 are core components of the Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems currently deployed in multiple areas of operation.

The Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems (SoS) is an evolutionary program that detects RAM launches, provides localized warning to the defended area, intercepts rounds in flight, and enhances response to and defeat of enemy forces. C-RAM combines multi-service fielded and non-developmental item sensors, command and control (C2) equipment, a commercial industry-produced warning system, and a modified U.S. Navy intercept system (Land-based Phalanx

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Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)		R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				
Weapon System [LPWS]), all connected via a wireless local area network. The Forward Area Air Defense Command and Control (FAAD C2) system, also under the management of the C-RAM Project Office, has been enhanced to integrate the sensors, weapons, and warning systems to provide C2 for the C-RAM SoS. C-RAM C2 software correlates the RAM sensor data, evaluates the threat, provides early warning, directs engagements, and cues counterfire systems and reaction forces. C-RAM C2 employs an agile software development, maintenance, and sustainment strategy, with Urgent Materiel Releases (UMR) every 6 months and Full Materiel Releases (FMR) every 15-18 months, to keep pace with rapidly fielding integrated systems to meet operational needs. The C-RAM SoS capability in theater is supported through the Overseas Contingency Operations (OCO) process. Base RDT&E supports C-RAM C2 basic Air Defense functionality as well as directed enhancements to the C-RAM SoS capability, such as development and integration of C-RAM network security enhancements and development of all-digital radar technology to address emerging threats.						
The Counter-Unmanned Aircraft Systems (C-UAS) effort is in response to Joint Urgent Operational Need (JUON) CC-0558 to support identification, development, testing, evaluation, and integration of technologies to provide an overall evolutionary capability to defeat small UAS threats at 89 U.S. Central Command (CENTCOM) sites. The C-UAS effort provides warfighters the ability to comprehensively detect, track, identify, and defeat enemy Groups 1 and 2 lightweight, low altitude, commercial off-the-shelf (COTS) UASs.						
B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		28.726	214.472	15.577	-	15.577
Current President's Budget		190.385	212.373	43.502	-	43.502
Total Adjustments		161.659	-2.099	27.925	-	27.925
• Congressional General Reductions		-0.023	-0.099			
• Congressional Directed Reductions		-	-15.000			
• Congressional Rescissions		-	-			
• Congressional Adds		162.800	13.000			
• Congressional Directed Transfers		-	-			
• Reprogrammings		-	-			
• SBIR/STTR Transfer		-1.118	-			
• Adjustments to Budget Years		-	-	27.925	-	27.925
Congressional Add Details (\$ in Millions, and Includes General Reductions)						
Project: 149: Counter-Rockets, Artillery & Mortar						
Congressional Add: All-Digital Radar Development						
Congressional Add: C-RAM Network Security Enhancements						
Congressional Add Subtotals for Project: 149						
Congressional Add Totals for all Projects						
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Change Summary Explanation The FY 2020 base funding increase of \$27.925 million is due to the transition of ALPS efforts from PE 0603327A.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 126 / PEO Electronic Protect			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
126: PEO Electronic Protect	-	0.000	0.000	27.925	-	27.925	15.634	4.153	0.000	0.000	0.000	47.712
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Note ALPS was previously funded under PE 0603327A.												
A. Mission Description and Budget Item Justification Army Long-Range Persistent Surveillance (ALPS) is a passive sensor that provides long range surveillance against Cruise Missile (CM), Fixed Wing (FW), Rotary Wing (RW), and Unmanned Aircraft System (UAS) threats. Prototype systems will be provided to meet multiple Combatant Command identified operational needs and to conduct an assessment. The objectives of this effort are to provide component and subsystem maturity in a system-of-systems environment and to reduce subsequent integration risk. This program will also integrate ALPS to support the Army Integrated Air and Missile Defense (AIAMD) architecture.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: ALPS Development and Integration Description: Provide ALPS systems to meet multiple Combatant Command operational needs and integrate ALPS to support the AIAMD architecture. Prototype systems will be provided to meet multiple Combatant Command operational needs and to conduct an assessment. The objectives of this effort are to prove component and subsystem maturity in a system-of-systems environment and to reduce subsequent integration risk. This program will also integrate ALPS to support the AIAMD architecture. FY 2020 Base Plans: Continue providing additional ALPS prototype systems to meet multiple Combatant Command identified operational needs and continue the assessment. Continue integration of ALPS to support the overall AIAMD architecture. FY 2019 to FY 2020 Increase/Decrease Statement: ALPS was previously funded under PE 0603327A.								-	-	27.925	-	27.925
Accomplishments/Planned Programs Subtotals								-	-	27.925	-	27.925

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019		
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 126 / PEO Electronic Protect			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EF9: System Integration and Test	69.558	77.188	107.746	-	107.746	111.080	121.308	37.186	40.999	0.000	565.065
• EX2: Lower Tier Air Missile Defense (LTAMD) Capability	57.437	89.248	427.772	-	427.772	376.738	332.322	241.461	87.500	0.000	1,612.478
• C50016: System Integration and Test Procurement	136.579	105.395	0.000	113.857	113.857	105.044	107.288	86.178	87.410	Continuing	Continuing
• FM3: Future Interceptor	-	-	8.000	-	8.000	8.000	8.000	88.918	120.000	0.000	232.918
• C53101: MSE Missile	1,103.040	1,131.276	0.000	736.541	736.541	767.495	749.530	999.731	898.131	793.430	7,179.174
• 0604319A: Indirect Fire Protection Capability	10.871	40.979	0.000	-	0.000	-	-	-	-	0.000	51.850
Increment 2-Intercept (IFPC2)											
• C62001: IFPC Inc 2-I Block 1 Missile 1	50.056	145.636	0.000	-	0.000	-	-	-	-	0.000	195.692
• C62002: IFPC INC 2- I BLOCK 1 SYSTEM	-	31.286	0.000	9.337	9.337	241.387	446.464	424.568	446.541	0.000	1,599.583
• 0604117A: Maneuver - Short Range Air Defense (M-SHORAD)	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	0.000	1,275.417
• C14300: M-SHORAD - Procurement	-	-	0.000	262.100	262.100	537.400	292.200	80.500	78.600	Continuing	Continuing
• 0604820A: Radar Development	31.651	39.289	105.243	-	105.243	103.427	105.394	65.574	69.407	0.000	519.985
• S40: Army Integrated Air and Missile Defense	339.051	322.263	208.938	-	208.938	130.859	63.738	33.193	94.845	0.000	1,192.887
• BZ5075: IAMD Battle Command System	-	-	29.629	-	29.629	254.834	353.929	417.426	413.775	Continuing	Continuing
• 0604741A: Air Defense Command, Control and Intelligence - Eng Dev	190.385	212.373	43.502	-	43.502	24.944	7.068	1.228	3.405	0.000	482.905
• AD5070: AIR & MSL Defense Planning & Control Sys	132.713	29.913	24.730	14.331	39.061	49.147	106.671	63.143	0.075	0.000	420.723
• 0605052A: Indirect Fire Protection Capability Inc 2 - Block 1	156.361	132.283	243.228	-	243.228	101.000	58.000	45.000	5.000	0.000	740.872
• 149: Counter-Rockets, Artillery & Mortar	17.250	14.844	1.277	-	1.277	0.909	-	-	-	0.000	34.280

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>				Project (Number/Name) 126 / <i>PEO Electronic Protect</i>			
C. Other Program Funding Summary (\$ in Millions)											
			<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Complete</u>	<u>Total Cost</u>
• 146: <i>Air & Msl Defense Planning Control Sys</i>	23.335	24.296	14.300	-	14.300	8.401	2.915	1.228	3.405	0.000	77.880
Remarks ALPS was previously funded under PE 0603327A.											
D. Acquisition Strategy ALPS utilizes an existing Defense Ordnance Technology Consortium (DOTC) Other Transaction Authority (OTA) to develop and integrate prototypes systems to meet multiple Combatant Command operational needs. An assessment of the prototype systems provided in response to the Combatant Command operational needs will be used to refine requirements and assess the Army's longer-term strategy.											
E. Performance Metrics N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev						Project (Number/Name) 126 / PEO Electronic Protect			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Other Government Agencies & Government Program Management	Various	Various : Various	-	-		-		1.432		-		1.432	Continuing	Continuing	Continuing
Subtotal			-	-		-		1.432		-		1.432	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
ALPS Development and Integration	Various	Various : Various	-	-		-		26.493	May 2020	-		26.493	Continuing	Continuing	Continuing
Subtotal			-	-		-		26.493		-		26.493	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		0.000		27.925		-		27.925	Continuing	Continuing	N/A
Remarks ALPS was previously funded under PE 0603327A.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

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2040 / 5

R-1 Program Element (Number/Name)

PE 0604741A / Air Defense Command,
Control and Intelligence - Eng Dev

Project (Number/Name)	Start Date	End Date	Duration (Days)	Actual Cost	Budgeted Cost	Variance	Cost Index	Performance Index	Cost Variance	Cost Performance Index	Cost Variance at Completion	Cost Performance Index at Completion
101	1/1/2020	1/31/2020	31	10000	10000	0	1.00	1.00	0	1.00	0	1.00
102	2/1/2020	2/28/2020	28	20000	20000	0	1.00	1.00	0	1.00	0	1.00
103	3/1/2020	3/31/2020	31	30000	30000	0	1.00	1.00	0	1.00	0	1.00
104	4/1/2020	4/30/2020	30	40000	40000	0	1.00	1.00	0	1.00	0	1.00
105	5/1/2020	5/31/2020	31	50000	50000	0	1.00	1.00	0	1.00	0	1.00
106	6/1/2020	6/30/2020	30	60000	60000	0	1.00	1.00	0	1.00	0	1.00
107	7/1/2020	7/31/2020	31	70000	70000	0	1.00	1.00	0	1.00	0	1.00
108	8/1/2020	8/31/2020	31	80000	80000	0	1.00	1.00	0	1.00	0	1.00
109	9/1/2020	9/30/2020	30	90000	90000	0	1.00	1.00	0	1.00	0	1.00
110	10/1/2020	10/31/2020	31	100000	100000	0	1.00	1.00	0	1.00	0	1.00
111	11/1/2020	11/30/2020	30	110000	110000	0	1.00	1.00	0	1.00	0	1.00
112	12/1/2020	12/31/2020	31	120000	120000	0	1.00	1.00	0	1.00	0	1.00
113	1/1/2021	1/31/2021	31	130000	130000	0	1.00	1.00	0	1.00	0	1.00
114	2/1/2021	2/28/2021	28	140000	140000	0	1.00	1.00	0	1.00	0	1.00
115	3/1/2021	3/31/2021	31	150000	150000	0	1.00	1.00	0	1.00	0	1.00
116	4/1/2021	4/30/2021	30	160000	160000	0	1.00	1.00	0	1.00	0	1.00
117	5/1/2021	5/31/2021	31	170000	170000	0	1.00	1.00	0	1.00	0	1.00
118	6/1/2021	6/30/2021	30	180000	180000	0	1.00	1.00	0	1.00	0	1.00
119	7/1/2021	7/31/2021	31	190000	190000	0	1.00	1.00	0	1.00	0	1.00
120	8/1/2021	8/31/2021	31	200000	200000	0	1.00	1.00	0	1.00	0	1.00
121	9/1/2021	9/30/2021	30	210000	210000	0	1.00	1.00	0	1.00	0	1.00
122	10/1/2021	10/31/2021	31	220000	220000	0	1.00	1.00	0	1.00	0	1.00
123	11/1/2021	11/30/2021	30	230000	230000	0	1.00	1.00	0	1.00	0	1.00
124	12/1/2021	12/31/2021	31	240000	240000	0	1.00	1.00	0	1.00	0	1.00
125	1/1/2022	1/31/2022	31	250000	250000	0	1.00	1.00	0	1.00	0	1.00
126	2/1/2022	2/28/2022	28	260000	260000	0	1.00	1.00	0	1.00	0	1.00
127	3/1/2022	3/31/2022	31	270000	270000	0	1.00	1.00	0	1.00	0	1.00
128	4/1/2022	4/30/2022	30	280000	280000	0	1.00	1.00	0	1.00	0	1.00
129	5/1/2022	5/31/2022	31	290000	290000	0	1.00	1.00				

126 / PEO Electronic Protect

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 126 / PEO Electronic Protect

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
ALPS Prototype Development and Integration	1	2017	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
146: Air & Msl Defense Planning Control Sys	-	23.335	24.296	14.300	-	14.300	8.401	2.915	1.228	3.405	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Air and Missile Defense Planning and Control System (AMDPCS) provides integration of air and missile defense operations at all echelon. Specifically, Air and Missile Defense Workstation (AMDWS) provides a correlated air picture using local radars, allowing the Commander the visibility and situational understanding of airspace; other automated defense design and staff planning tools in AMDWS afford Soldiers horizontal and vertical collaborative planning with adjacent units. Air Defense System Integrator (ADSI) serves as a joint tactical data link gateway/air picture, and when correlated by Forward Area Air Defense Command and Control (FAAD C2) and displayed on AMDWS, provides a near-real time, three dimensional joint air picture for the Commander. Joint Tactical Terminal (JTT) provides Soldiers theater ballistic missile (TBM) early warning, allowing them to take appropriate actions. AMDPCS is fielded to Army air and missile defense commands (AAMDC), air defense artillery brigades (ADA BDE), air and missile defense battalions (AMD BN), and Terminal High Altitude Area Air Defense batteries (THAAD BTRY). Air Defense Airspace Management (ADAM), a variant of AMDPCS with similar capabilities, is fielded to corps, divisions, brigade combat teams (BCT), and multi-functional support brigades. As part of capability and technology reuse, AMDWS and FAAD C2 are core components of the Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems currently deployed in multiple areas of operation.

FY 2020 Base dollars in the amount of \$14.300 million fund development, engineering, testing, and certification of AMDWS software; interoperability engineering, testing, and evaluation of AMDPCS family-of-systems shelters; and software system certification testing, accreditation, and approval of authority-to-operate (ATO).

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: AMDWS Software Development	12.715	12.438	11.726	-	11.726
Description: AMDWS development and support of LandWarNet as well as various Common Operating Environments (COE). AMDWS software engineering and development are consistent with COE requirements, evolving the AMDPCS requirements to a net-centric environment, and fulfilling the air defense force operations capabilities identified in the AMD TRADOC capabilities requirement list. Virtualize AMDWS software development and rehost onto COE Real-Time Computing Environment common hardware systems. Support the evolving development of the force operations portion of the Integrated Air and Missile Defense (IAMD) system-of-systems.					
FY 2019 Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue AMDWS software engineering consistent with COE v3 requirements. Finalize development of a Windows 10 version of AMDWS, test, and work material release for fielding to replace all Windows 7 AMDWS. Support COE v3 integration activities with both Real Time Safety Critical Embedded Computing Environment (RTSCE CE) and Command Post Computing Environment (CP CE). Continue to implement interface to the Passive Identification, Friend or Foe (PIFF) in support of commercial aircraft de-confliction. FY 2020 Base Plans: Will continue AMDWS software engineering consistent with COE requirements. Upgrade the Windows 10 compliant version of AMDWS with BitLocker encryption features and replace all Windows 7 AMDWS. Perform COE integration activities with both RTSCE CE and CP CE. Continue software interoperability modifications with C2BMC, C2IS, C2AOS, AOC WS, Patriot, IBCS, THAAD, C-RAM C2, TBMCS, COE, and ABCS to support warfighter functions. Build threat sets and weapon platform capabilities for Counter-Unmanned Aerial Systems (C-UAS) planning and defense design capabilities to support the C-RAM C-UAS planning requirements. This effort's funding will be executed by the AMDPCS program. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 adjustment due to revised economic assumptions.						
Title: Passive Identification, Friend or Foe (PIFF) Description: PIFF receives position and identification data from self-reporting aircraft, to include UAS, within 250 nautical miles. This capability supports the air picture and situational awareness for commanders and staff, thereby enhancing survivability and reducing the risk of fratricide. FY 2019 Plans: Continue system engineering which includes cyber, data at rest, and a new IFF Response Processor (IRP) Card design. This non-recurring engineering effort will support the development of a common product for AMDPCS and Integrated Air and Missile Defense Battle Command Systems (IBCS). FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 funding completes PIFF research and development efforts.		7.960	8.211	-	-	-
Title: Engineering, Development, Test and Evaluation Description: Engineering, development, test, and evaluation of the AMDPCS family-of-systems shelters objective configuration; evaluation and finalization of the AMDPCS tactical communications, data processing, and vehicle/shelter/power generation/environmental system block upgrade program for fielded systems.		1.867	1.905	1.859	-	1.859

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Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev		Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: Continue evaluations of emerging technologies and hardware interoperability. Continue support and development of IBCS-ADAM COE configurations and PIFF integration/testing at NIE 19.1, 19.2, 20.1 and 20.2. Assess system to ensure equipment meets Army requirements IAW Command Post Directed Requirement, 14 Dec 17.						
FY 2020 Base Plans: Will continue evaluations of emerging technologies and hardware interoperability. Continue support and development of IBCS-ADAM COE configurations. Analyze system hardware to ensure equipment meets Army requirements IAW command post directed requirement, 14 Dec 17. Test and evaluate replacement equipment needed to maintain cyber and command post directed requirement compliance. This effort's funding will be executed by the AMDPCS program.						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 adjustment due to revised economic assumptions.						
Title: Software System Certification Testing, Accreditation, and Approval of Authority-to-Operate (ATO) Description: Software system certification testing, accreditation, and approval of ATOs for the various software systems; BitLocker encryption and other authorized/approved G6 software implementation; Army and joint integration and interoperability assessments.		0.793	0.851	0.715	-	0.715
FY 2019 Plans: Continue software systems certification testing, accreditation, and approval of ATOs as required by the DOD Risk Management Framework process. Continue Army and Joint integration and interoperability assessments.						
FY 2020 Base Plans: Will continue software systems certification testing, accreditation, and approval of ATOs as required by the DOD risk management framework process. Continue Army and joint integration and interoperability assessments. This effort's funding will be executed by the AMDPCS program.						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 adjustment due to revised economic assumptions.						
Title: FY 2019 SBIR / STTR Transfer Description: FY 2019 SBIR / STTR Transfer		-	0.891	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys				
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: FY 2019 SBIR / STTR Transfer												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer												
Accomplishments/Planned Programs Subtotals								23.335	24.296	14.300	-	14.300
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• AD5070: AIR & MSL Defense Planning & Control Sys	132.713	29.913	24.730	14.331	39.061	49.147	106.671	63.143	0.075	0.000	420.723	
• 149: Counter-Rockets, Artillery & Mortar	17.250	14.844	1.277	-	1.277	0.909	-	-	-	Continuing	Continuing	
• H30503: Rocket, Artillery, Mortar (RAM) Warn	31.380	34.393	0.000	-	0.000	-	-	-	-	0.000	65.773	
• H30504: C-RAM Enhancements	63.000	6.304	9.127	-	9.127	0.703	-	-	-	0.000	79.134	
• DU3: IFPC2	10.871	40.979	0.000	-	0.000	-	-	-	-	Continuing	Continuing	
• 0605457A: Army Integrated Air and Missile Defense (AIAMD)	339.051	322.263	208.938	-	208.938	130.859	63.738	33.193	94.845	0.000	1,192.887	
• BZ5075: IAMD Battle Command System	-	-	29.629	-	29.629	254.834	353.929	417.426	413.775	Continuing	Continuing	
• E10: Sentinel	31.651	39.289	105.243	-	105.243	103.427	105.394	65.574	69.407	Continuing	Continuing	
• FG5: Counter Unmanned Aerial Systems (UAS)	149.800	173.233	0.000	-	0.000	-	-	-	-	0.000	323.033	
• H30505: Counter Unmanned Aerial Systems (C-UAS) Efforts	571.733	250.800	20.000	-	20.000	-	-	-	-	0.000	842.533	
• 0604117A: Maneuver - Short Range Air Defense (M-SHORAD)	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	0.000	1,275.417	
Remarks												
This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys
D. Acquisition Strategy <p>The acquisition strategy relies on non-development items (NDI) and evolutionary software development to rapidly meet the demands of air defense battle management command, control, communications, computers, and intelligence (BM/C4I) requirements and to keep pace with automated information technologies. The concept of evolutionary software development will be accomplished in a series of AMDWS block releases and upgrades. AMDPCS is being developed for both the Army's Active and Reserve components.</p> <p>AMDWS software development is contracted sole source (SS)/cost plus fixed fee (CPFF) to Northrop Grumman. PIFF development was competitively awarded to Telephonics, Inc. on a CPFF OTA contract.</p> <p>AMDWS is a prime component of C-RAM. It provides the forward operating base (FOB) commander with clearance of fires display and enemy munitions flight paths.</p> E. Performance Metrics N/A		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev						Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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 Administration	Various	Various : Various	30.956	1.143	Dec 2017	1.170	Dec 2018	1.158	Dec 2019	-		1.158	Continuing	Continuing	Continuing
Subtotal			30.956	1.143		1.170		1.158		-		1.158	Continuing	Continuing	N/A
Remarks Not Applicable															
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
AMDWS Software Development and Engineering	SS/CPFF	Northrop Grumman : Huntsville AL	143.651	12.228	Oct 2017	12.018	Oct 2018	10.276	Oct 2019	-		10.276	Continuing	Continuing	Continuing
PIFF Development Engineering	C/FFP	Telephonics : Farmingdale NY	-	6.893	Aug 2018	6.804	Dec 2018	-		-		-	0.000	13.697	-
ADSI Software Development and Engineering	SS/T&M	Ultra Electronics : Austin, TX	6.859	-		-		-		-		-	0.000	6.859	-
Developmental Engineering	Various	Various : Various	41.582	2.768	Dec 2017	3.092	Dec 2018	2.717	Dec 2019	-		2.717	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	To Be Determined : To Be Determined	-	-		0.891		-		-		-	0.000	0.891	-
Subtotal			192.092	21.889		22.805		12.993		-		12.993	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Certification/Testing	Various	JITC : Ft Huachuca, AZ	1.182	0.140	Feb 2018	0.148	Feb 2019	0.063	Feb 2020	-		0.063	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Interoperability Assessment	Various	CTSF : Ft Hood, TX	1.567	0.163	May 2018	0.173	May 2019	0.086	May 2020	-		0.086	Continuing	Continuing	Continuing
Subtotal			2.749	0.303		0.321		0.149		-		0.149	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			225.797	23.335		24.296		14.300		-		14.300	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity

2040 / 5

R-1 Program Element (Number/Name)

PE 0604741A / Air Defense Command,
Control and Intelligence - Eng Dev

Project (Number/Name)

146 / Air & Msl Defense Planning Control
Sys

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Full Operational Capability AMDPCS																												
AMDWS Block V Contract																												
AMDWS Contract																												
AMDWS Software Block Development, Testing, Certification																												
AMDWS Capability Set (CS) and COE Development / Test																												
AMDWS AMD Interfaces: C2BMC, C2IS, C2AOS, AOC WS, etc																												
Passive Identification, Friend or Foe (PIFF) Eng./Integration																												
Army Warfighting Assess. 18.1 / Network Integration Eval. 18.2																												
Joint Warfighting Assessment (JWA) 19.1																												
JWA 20.1																												
JWA 21.1																												
JWA 22.1																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 146 / <i>Air & Msl Defense Planning Control Sys</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Full Operational Capability AMDPCS	1	2023	1	2023
AMDWS Block V Contract	2	2011	4	2021
AMDWS Contract	2	2021	2	2026
AMDWS Software Block Development, Testing, Certification	3	2007	4	2023
AMDWS Capability Set (CS) and COE Development / Test	1	2013	4	2023
AMDWS AMD Interfaces: C2BMC, C2IS, C2AOS, AOC WS, etc	4	2012	4	2021
Passive Identification, Friend or Foe (PIFF) Eng./Integration	4	2018	1	2021
ADSI Software Engineering Development and Test	1	2005	4	2017
AWA 16.1 (COE ADAM) DOTMLPF Eval / NIE 16.2	4	2015	3	2016
Army Warfighting Assessment (AWA) 17.1 / NIE 17.2	4	2016	3	2017
Army Warfighting Assess. 18.1 / Network Integration Eval. 18.2	4	2017	3	2018
Joint Warfighting Assessment (JWA) 19.1	4	2018	3	2019
JWA 20.1	4	2019	3	2020
JWA 21.1	4	2020	3	2021
JWA 22.1	4	2021	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
149: Counter-Rockets, Artillery & Mortar	-	17.250	14.844	1.277	-	1.277	0.909	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems (SoS) is an evolutionary program that detects RAM launches, provides localized warning to the defended area, intercepts rounds in flight, and enhances response to and defeat of enemy forces. C-RAM combines multi-service fielded and non-developmental item sensors, command and control (C2) equipment, a commercial industry-produced warning system, and a modified U.S. Navy intercept system (Land-based Phalanx Weapon System [LPWS]), all connected via a wireless local area network. The Forward Area Air Defense Command and Control (FAAD C2) system, also under the management of the C-RAM Project Office, has been enhanced to integrate the sensors, weapons, and warning systems to provide C2 for the C-RAM SoS. C-RAM C2 software correlates the RAM sensor data, evaluates the threat, provides early warning, directs engagements, and cues counterfire systems and reaction forces. C-RAM C2 employs an agile software development, maintenance, and sustainment strategy, with Urgent Materiel Releases (UMR) every 6 months and Full Materiel Releases (FMR) every 15-18 months, to keep pace with rapidly fielding integrated systems to meet operational needs. The C-RAM SoS capability in theater is supported through the Overseas Contingency Operations (OCO) process. Base RDT&E supports C-RAM C2 basic Air Defense functionality as well as directed enhancements to the C-RAM SoS capability, such as development and integration of C-RAM network security enhancements and development of all-digital radar technology to address emerging threats.

FY 2020 Base RDT&E dollars in the amount of \$1.277 million provide FAAD/C-RAM C2 development and enhancements based on changes in threat, integration of new interfaces, technology insertions, and interoperability requirements, and provide development and regression testing to ensure C-RAM C2 enhancements do not negatively impact C-RAM SoS performance.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: FAAD/C-RAM C2 Software Development and Enhancements	4.250	1.785	1.277	-	1.277
Description: Funds system-of-systems development and upgrades based on the bi-annual release of the Army Air and Missile Defense System (AAMDS) System Threat Assessment Report (STAR) and changes in threat, integration of emerging requirements from external PMs (Mission Command) and other services/agencies, technology insertions (IP-based communications), and interoperability requirements (joint interoperability, military standard, information assurance compliance, external interface updates). Provides development and regression testing to ensure C-RAM C2 enhancements do not negatively impact the performance of the other C-RAM pillars (Shape, Sense, Warn, Intercept, Respond, and Protect). Includes continued development of electronic warfare capabilities to counter evolving threats. Includes product assurance, test cycles, live fire					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev		Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
verification testing, safety, training and training documentation, integrated logistics support, and all other required functions associated with fielding a major C2 system.						
FY 2019 Plans: Implement new sensors, effectors, electronic warfare, and camera systems to support C-UAS and M-SHORAD initiatives and continue IAMD convergence and strategic planning. Conduct Army Interoperability Certification testing to support Full Materiel Release (FMR) of C-RAM C2 v5.6A.						
FY 2020 Base Plans: Support role-based user interface, initiate development of advanced battle manager and data link manager with external link forwarding and on-the-move command and control. This effort's funding will be executed by the FAAD/C-RAM program.						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 adjustment due to revised economic assumptions.						
Title: FY 2019 SBIR / STTR Transfer		-	0.059	-	-	-
Description: FY 2019 SBIR / STTR Transfer						
FY 2019 Plans: FY 2019 SBIR / STTR Transfer						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer						
Accomplishments/Planned Programs Subtotals		4.250	1.844	1.277	-	1.277
		FY 2018	FY 2019			
Congressional Add: All-Digital Radar Development		8.000	8.000			
FY 2018 Accomplishments: All-Digital Radar Development						
FY 2019 Plans: All-Digital Radar Development						
Congressional Add: C-RAM Network Security Enhancements		5.000	5.000			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev		Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar	
			FY 2018	FY 2019	
FY 2018 Accomplishments: C-RAM Network Security Enhancements					
FY 2019 Plans: C-RAM Network Security Enhancements					
Congressional Adds Subtotals			13.000	13.000	

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• H30503: <i>Rocket, Artillery, Mortar (RAM) Warn</i>	31.380	34.393	0.000	-	0.000	-	-	-	-	0.000	65.773
• H30504: <i>C-RAM Enhancements</i>	63.000	6.304	9.127	-	9.127	0.703	-	-	-	0.000	79.134
• 146: <i>Air & Msl Defense Planning Control Sys</i>	23.335	24.296	14.300	-	14.300	8.401	2.915	1.228	3.405	Continuing	Continuing
• AD5070: <i>AIR & MSL Defense Planning & Control Sys</i>	132.713	29.913	24.730	14.331	39.061	49.147	106.671	63.143	0.075	0.000	420.723
• DU3: <i>IFPC2</i>	10.871	40.979	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• S40: <i>Army Integrated Air and Missile Defense</i>	339.051	322.263	208.938	-	208.938	130.859	63.738	33.193	94.845	Continuing	Continuing
• BZ5075: <i>IAMD Battle Command System</i>	-	-	29.629	-	29.629	254.834	353.929	417.426	413.775	Continuing	Continuing
• E10: <i>Sentinel</i>	31.651	39.289	105.243	-	105.243	103.427	105.394	65.574	69.407	Continuing	Continuing
• L86: <i>LIGHTWEIGHT COUNTER MORTAR RADAR (LCMR)</i>	2.051	4.189	4.913	-	4.913	5.379	3.459	4.288	4.557	Continuing	Continuing
• L88: <i>Enhanced AN/TPQ 36</i>	7.149	5.655	12.381	-	12.381	14.647	8.961	9.450	10.040	Continuing	Continuing
• B05201: <i>Lightweight Counter Mortar Radar</i>	17.080	6.107	5.400	-	5.400	5.500	8.326	7.380	10.072	Continuing	Continuing
• B05310: <i>AN/TPQ-53 Counterfire Target Acquisition Radar</i>	400.530	324.150	16.416	-	16.416	10.267	12.175	30.239	42.312	Continuing	Continuing
• FG5: <i>Counter Unmanned Aerial Systems (UAS)</i>	149.800	173.233	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• H30505: <i>Counter Unmanned Aerial Systems (C-UAS) Efforts</i>	571.733	250.800	20.000	-	20.000	-	-	-	-	Continuing	Continuing
• 0604117A: <i>Maneuver - Short Range Air Defense (M-SHORAD)</i>	19.201	79.016	33.100	6.000	39.100	105.700	341.100	382.600	308.700	0.000	1,275.417

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>				Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>			
C. Other Program Funding Summary (\$ in Millions)											
			<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Complete</u>	<u>Total Cost</u>
<u>Remarks</u>											
This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.											
<u>D. Acquisition Strategy</u>											
The C-RAM program is following an evolutionary acquisition strategy for rapid fielding of mature technology to the user. The objective of the strategy is to balance needs, available technology, and resources to quickly provide a robust capability to engage RAM threats. Multiple C-RAM systems have transitioned to acquisition programs, including C-RAM Intercept, which fields existing LPWS guns to two Indirect Fire Protection Capability/Avenger battalions, and RAM Warn, which provides early, localized warning to all maneuver brigade combat teams. Development and upgrade of FAAD/C-RAM C2 software, to include enhanced capability to support emerging mission command requirements, technology insertion, and interoperability, is accomplished through a five-year CPIF contract awarded to Northrop Grumman Mission Systems.											
<u>E. Performance Metrics</u>											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev						Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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 Administration	Various	Various : Various	26.249	0.353	Nov 2017	0.149	Nov 2018	0.102	Nov 2019	-		0.102	Continuing	Continuing	Continuing
Subtotal			26.249	0.353		0.149		0.102		-		0.102	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
C-RAM C2 Development and Enhancements	C/CPIF	Northrop Grumman : Redondo Beach, CA	104.639	1.950	Apr 2018	0.895	Apr 2019	1.175	Apr 2020	-		1.175	Continuing	Continuing	Continuing
Secure Communications	SS/CPFF	Northrop Grumman : Huntsville, AL	9.578	-		-		-		-		-	0.000	9.578	-
Secure Communications (Next Gen)	C/CPFF	Northrop Grumman : Huntsville AL	5.000	5.000	Jun 2019	5.000	Jun 2019	-		-		-	0.000	15.000	-
All-Digital Radar Development	C/FFP	TBD : TBD	-	8.000	Feb 2019	8.000	Feb 2019	-		-		-	Continuing	Continuing	Continuing
LPWS Enhancements	C/CPIF	Raytheon Company : Tucson, AZ	10.307	-		-		-		-		-	0.000	10.307	-
FY 2019 SBIR / STTR Transfer	TBD	To Be Determined : To Be Determined	-	-		0.059		-		-		-	0.000	0.059	-
Subtotal			129.524	14.950		13.954		1.175		-		1.175	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Miscellaneous Test Support	Various	Various : Various	23.394	0.574	Aug 2018	0.242	Jan 2019	-		-		-	Continuing	Continuing	Continuing
End-to-End Modeling & Simulation	SS/CPFF	Northrop Grumman : Redondo Beach, CA	12.748	1.373	Aug 2018	0.499	Sep 2019	-		-		-	0.000	14.620	-
Subtotal			36.142	1.947		0.741		-		-		-	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army											Date: March 2019						
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev					Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar							
					Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals					191.915	17.250		14.844		1.277		-		1.277	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev		Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
C-RAM System-of-Systems (SoS)																												
FAAD/C-RAM C2 Development																												
C-RAM Enhancements - Development, Integration & Test																												
C-RAM C2 v5.5C-2.2p3 Full Software Release																												
C-RAM C2 v5.6A-1.0p1.1 and v5.6A-1.0p3 Urgent Materiel Release (UMR)																												
LPWS Sp. 6.4.3.1 and C-RAM C2 v5.6A-2.2 UMR																												
C-RAM C2 v5.6A Full Materiel Release (FMR)																												
C-RAM C2 v5.6B FMR																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
C-RAM System-of-Systems (SoS)	1	2007	4	2019
FAAD/C-RAM C2 Development	1	2013	4	2021
C-RAM Directed Enhancements - Integration & Test	1	2012	4	2017
C-RAM Enhancements - Development, Integration & Test	1	2016	2	2020
C-RAM C2 v5.5C-2.2p3 Full Software Release	3	2018	3	2018
C-RAM C2 v5.6A-1.0p1.1 and v5.6A-1.0p3 Urgent Materiel Release (UMR)	4	2018	4	2018
LPWS Sp. 6.4.3.1 and C-RAM C2 v5.6A-2.2 UMR	2	2019	2	2019
C-RAM C2 v5.6A Full Materiel Release (FMR)	3	2019	3	2019
C-RAM C2 v5.6B FMR	3	2020	3	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) FG5 / Counter Unmanned Aerial Systems (UAS)			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FG5: Counter Unmanned Aerial Systems (UAS)	-	149.800	173.233	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	323.033
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Counter-Unmanned Aircraft Systems (C-UAS) effort is in response to Joint Urgent Operational Need (JUON) CC-0558 to support identification, development, testing, evaluation, and integration of technologies to provide an overall evolutionary capability to defeat small UAS threats at 89 U.S. Central Command (CENTCOM) sites. The C-UAS effort provides warfighters the ability to comprehensively detect, track, identify, and defeat enemy Groups 1 and 2 lightweight, low altitude, commercial off-the-shelf (COTS) UASs.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Counter-UAS Capability Development	149.800	170.775	-	-	-
Description: Development, integration, and test of electronic warfare and kinetic kill defeat options for the Low-slow-small UAS Integrated Defeat System (LIDS).					
FY 2019 Plans: Develop, integrate, and test kinetic, or hard kill, defeat solutions into the Low-slow-small UAS Integrated Defeat System (LIDS): 1) develop Coyote medium range seeker; 2) develop lightweight flat panel radar; 3) increase range of mobile gun weapon; and 4) develop and integrate multi-function Electronic Warfare (EW) with full On-The-Move (OTM) capability.					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 is the last year of funding to complete C-UAS development in support of JUON CC-0558.					
Title: FY 2019 SBIR / STTR Transfer	-	2.458	-	-	-
Description: FY 2019 SBIR / STTR Transfer					
FY 2019 Plans: FY 2019 SBIR / STTR Transfer					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	149.800	173.233	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army								Date: March 2019			
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>				Project (Number/Name) FG5 / <i>Counter Unmanned Aerial Systems (UAS)</i>			

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• H30505: <i>Counter Unmanned Aerial Systems (C-UAS) Efforts</i>	571.733	250.800	20.000	-	20.000	-	-	-	-	0.000	842.533

Remarks

D. Acquisition Strategy

The C-UAS program is executing an acquisition strategy for rapid development, integration, testing, and deployment of emerging technologies to selected CENTCOM sites. Capabilities are being deployed in increments, with an interim capability delivered now and spiral enhancements to be provided over time. The C-UAS effort utilizes multiple contract vehicles, types, and vendors.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev						Project (Number/Name) FG5 / Counter Unmanned Aerial Systems (UAS)			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	Various	Various : Various	12.640	13.031	Jun 2018	9.930		-		-		-	0.000	35.601	-
Subtotal			12.640	13.031		9.930		-		-		-	0.000	35.601	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Fixed/Mobile System Development	Various	Various : Various	38.244	29.400	Sep 2018	17.081		-		-		-	0.000	84.725	-
Kinetic Defeat Development	Various	Various : Various	35.808	44.000	Sep 2018	66.955	Feb 2019	-		-		-	0.000	146.763	-
Sensor Development	Various	Various : Various	19.099	20.800	Sep 2018	42.820	Mar 2019	-		-		-	0.000	82.719	-
C-UAS C2 Software Development	C/CPIF	Northrop Grumman : Redondo Beach, CA	6.000	19.191	Apr 2018	7.500	Jun 2019	-		-		-	0.000	32.691	-
Dismounted/Handheld Systems Development	Various	Various : Various	13.300	4.054	Jul 2018	-		-		-		-	0.000	17.354	-
FY 2019 SBIR / STTR Transfer	TBD	To Be Determined : To Be Determined	-	-		2.458		-		-		-	0.000	2.458	-
Subtotal			112.451	117.445		136.814		-		-		-	0.000	366.710	N/A
Remarks The original Counter UAS Systems Development line was broken out to include a greater level of detail for each of the system/subsystem development efforts (i.e., fixed/mobile, kinetic defeat, sensor, C2 software, and dismounted/handheld); however, the FY 2019 cost column was locked and could not be adjusted to reflect this breakout.															
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Test Support	Various	Various : Various	18.809	19.324	May 2018	26.489	Apr 2019	-		-		-	0.000	64.622	-
Subtotal			18.809	19.324		26.489		-		-		-	0.000	64.622	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army										Date: March 2019			
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>					Project (Number/Name) FG5 / <i>Counter Unmanned Aerial Systems (UAS)</i>			
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	143.900	149.800		173.233		-		-		-	0.000	466.933	N/A
Remarks													

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>		Project (Number/Name) FG5 / <i>Counter Unmanned Aerial Systems (UAS)</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
C-UAS System Development																												
Mobile LIDS (M-LIDS) Inc 1 Testing and Downselect																												
Expeditionary LIDS (E-LIDS) Engineering and Record Test																												
M-LIDS Inc 1 Engineering and Record Test																												
Inc 1 System-of-Systems Record Test																												
E-LIDS/M-LIDS Inc 2 Engineering Test																												
E-LIDS/M-LIDS Inc 2 Record Test																												
C-RAM/C-UAS System-of-Systems Testing																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) FG5 / <i>Counter Unmanned Aerial Systems (UAS)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
C-UAS System Development	1	2017	4	2019
Mobile LIDS (M-LIDS) Inc 1 Testing and Downselect	1	2018	1	2018
Expeditionary LIDS (E-LIDS) Engineering and Record Test	2	2018	2	2018
M-LIDS Inc 1 Engineering and Record Test	3	2018	4	2018
Inc 1 System-of-Systems Record Test	4	2018	1	2019
E-LIDS/M-LIDS Inc 2 Engineering Test	3	2019	3	2019
E-LIDS/M-LIDS Inc 2 Record Test	3	2019	3	2019
C-RAM/C-UAS System-of-Systems Testing	3	2018	3	2019