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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2020 Navy	<b>Date:</b> March 2019
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<b>Appropriation/Budget Activity</b> 1319: Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development	<b>R-1 Program Element (Number/Name)</b> PE 0205601N / Harm Improvement
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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	811.851	70.415	120.762	138.431	-	138.431	67.887	46.716	54.374	60.593	Continuing	Continuing
1780: HARM Improvement	51.724	6.396	6.256	7.105	-	7.105	7.090	7.104	7.239	7.383	Continuing	Continuing
2185: AARGM	721.810	14.798	15.266	11.677	-	11.677	11.192	4.787	4.886	4.985	Continuing	Continuing
2189: AARGM ER	38.317	49.221	99.240	119.649	-	119.649	49.605	34.825	42.249	48.225	Continuing	Continuing

**Program MDAP/MAIS Code:**  
**Project MDAP/MAIS Code(s):** 368

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

Research, Development, Test and Evaluation funding for the Joint Service Anti-Radiation Missile (ARM) program, which will include near and far term performance improvements, cost reduction, and studies that establish future development requirements. Specific initial efforts include lower cost seeker component development and seeker aided fuzing to enhance warhead performance in low angle impacts and against certain ship targets.

JUSTIFICATION FOR BUDGET ACTIVITY: These projects are funded under Operational Systems Development because they include development efforts to upgrade systems that have been fielded or have received approval for full-rate production and anticipate funding in the current or subsequent fiscal year.

<b><u>B. Program Change Summary (\$ in Millions)</u></b>	<b><u>FY 2018</u></b>	<b><u>FY 2019</u></b>	<b><u>FY 2020 Base</u></b>	<b><u>FY 2020 OCO</u></b>	<b><u>FY 2020 Total</u></b>
Previous President's Budget	87.989	120.762	116.451	-	116.451
Current President's Budget	70.415	120.762	138.431	-	138.431
Total Adjustments	-17.574	0.000	21.980	-	21.980
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-7.200	0.000			
• SBIR/STTR Transfer	-2.454	0.000			
• Program Adjustments	0.000	0.000	22.355	-	22.355
• Rate/Misc Adjustments	0.000	0.000	-0.375	-	-0.375
• Congressional Directed Reductions	-7.920	-	-	-	-
Adjustments					

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Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement	
<u>Change Summary Explanation</u> Project Unit 1780: FY 2020 funding increase is to support increased Developmental Test & Evaluation at NAWCWD China Lake, CA for the ARM Foreign Material Assessment (FMA) project.  Project Unit 2185: FY 2020 funding decrease is due to the phasing of M Code development and Software Development efforts.  Project Unit 2189: FY 2020 funding increase is due to the commencement of Developmental Test & Evaluation and the Early Operational Assessment (EOA).		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 1780 / HARM Improvement			
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
1780: HARM Improvement	51.724	6.396	6.256	7.105	-	7.105	7.090	7.104	7.239	7.383	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

## A. Mission Description and Budget Item Justification

Anti-Radiation Missile (ARM) Improvement is a combination of the Navy-led High Speed Anti-Radiation Missile (HARM) program and the Advanced Anti-Radiation Guide Missile (AARGM) program. The HARM program has undergone several Engineering Change Plans since ceasing production in 1983. Currently, the inventory consists of AGM-88B/C missiles with Block 5/A software which provides increased capability tracking emitters, improved targeting against a larger set of air defense related systems and an improved seeker. HARM is a Navy led joint service program with the United States Air Force. AARGM is a program derived from a Small Business Innovative Research (SBIR) program that developed a dual mode guidance section, incorporating a Millimeter Wave (MMW) radar with an advanced anti-radiation homing seeker. This provides the capability to counter shutdown of emitters. Additional capability for AARGM consists of Global Positioning System (GPS) capability, MMW terminal guidance, netted targeting real time feed via Integrated Broadcast System (IBS), Weapon Impact Assessment (WIA), GPS point-to-point weapon engagement and impact avoidance zone/missile impact zones.

ARM Improvement efforts require periodic updates to the user data base based on changing threat parameters, enhanced air defense engagement tactics and emerging systems. These funds provide the opportunity to conduct ground and flight testing against foreign systems, called Foreign Material Assessment (FMA). The result of FMA is an analytical report on findings, updates to fleet tactics manuals, curriculum changes to the Suppression of Enemy Air Defenses / Destruction of Enemy Air Defenses lead Air Combat Training Curriculum course work and weapon school tactics/training and procedure briefs. FMA is focused on air defense weapon system and non-traditional target exploitation, analysis and subsequent integration and response to ensure that the AGM-88 ARM weapon systems remains relevant in the planned operational environment.

## B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>	<b>FY 2020 OCO</b>	<b>FY 2020 Total</b>
<b>Title:</b> ARM Foreign Material Assessment (FMA)	6.396	6.256	7.105	0.000	7.105
<b>Articles:</b>	-	-	-	-	-
<b>FY 2019 Plans:</b>					
The FMA team will continue to conduct FMA testing (both ground-based and captive flight testing), data analysis, and systems engineering to maximize AARGM and HARM effectiveness against threat air defense systems in FY 2019. The expanded capabilities of the AARGM from the legacy HARM will take advantage of the additional lab capabilities to compliment already existing HARM lab capabilities. This will enable digital Anti-Radiation Homing (ARH) seeker and Millimeter Wave (MMW) terminal seeker assessment which are unique capabilities to AARGM. FMA assessments will remain focused on new threat systems as they become available for evaluation as well as theater/country-specific systems of interest. Priorities coordinated through the Fleet ARM Steering Committee. Expect continued testing and evaluation on advanced Surface-to-Air weapons and related IADS,					

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Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement		Project (Number/Name) 1780 / HARM Improvement		
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>jammers, and ARM countermeasures, and non-traditional ARM targets. Fleet engagement will continue as a key element of testing, engineering, and analytical efforts, which includes funding for threat assessment, operational updates, and integration efforts. Additional test priorities include characterizing complex systems in the field, so that FMA assessments can directly populate missile threat data libraries with updated attributes to enhance track quality for HARM and AARGM. Assess special projects developmental improvements against foreign material.</p> <p><b>FY 2020 Base Plans:</b> The FMA team will continue to conduct FMA testing (both ground-based and captive flight testing), data analysis, and systems engineering to maximize AARGM and HARM effectiveness against threat air defense systems in FY 2020. The expanded capabilities of the AARGM from the legacy HARM will take advantage of the additional lab capabilities to compliment already existing HARM lab capabilities. This will enable digital Anti-Radiation Homing (ARH) seeker and Millimeter Wave (MMW) terminal seeker assessment which are unique capabilities to AARGM. FMA assessments will remain focused on new threat systems as they become available for evaluation as well as theater/country-specific systems of interest. Priorities coordinated through the Fleet ARM Steering Committee. Expect continued testing and evaluation on advanced Surface-to-Air weapons and related IADS, jammers, and ARM countermeasures, and non-traditional ARM targets. Fleet engagement will continue as a key element of testing, engineering, and analytical efforts, which includes funding for threat assessment, operational updates, and integration efforts. Additional test priorities include characterizing complex systems in the field, so that FMA assessments can directly populate missile threat data libraries with updated attributes to enhance track quality for AARGM and HARM. Assess special projects developmental improvements against foreign material.</p> <p><b>FY 2020 OCO Plans:</b> N/A</p> <p><b>FY 2019 to FY 2020 Increase/Decrease Statement:</b> FY 2019 to FY 2020 increase due to increased testing requirements and capabilities at Naval Air Warfare Center Weapons Division (NAWCWD) China Lake, CA.</p>						
<b>Accomplishments/Planned Programs Subtotals</b>		6.396	6.256	7.105	0.000	7.105
<b>C. Other Program Funding Summary (\$ in Millions)</b>						
N/A						
<b>Remarks</b>						

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2020 Navy		<b>Date:</b> March 2019
<b>Appropriation/Budget Activity</b> 1319 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>	<b>Project (Number/Name)</b> 1780 / <i>HARM Improvement</i>
<p><b><u>D. Acquisition Strategy</u></b></p> <p>ARM system updates are provided through the System Support Activity (SSA) at Naval Air Warfare Center - Weapons Division (NAWCWD), China Lake, CA. ARM fleet priorities are set by the Fleet ARM Steering Committee.</p> <p><b><u>E. Performance Metrics</u></b></p> <p>Continue FMA testing and engineering analysis against new and evolving foreign threats.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 1780 / HARM Improvement					
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
Systems Engineering	WR	NAWCWD : China Lake, CA	6.876	1.752	Nov 2017	1.668	Nov 2018	1.679	Nov 2019	-		1.679	Continuing	Continuing	Continuing
Systems Engineering	Various	Various : Various	0.000	0.300	Dec 2017	0.300	Dec 2018	0.306	Dec 2019	-		0.306	0.000	0.906	-
Prior Year Prod Dev no longer funded in FYDP	Various	Various : Various	24.732	0.000		0.000		0.000		-		0.000	0.000	24.732	-
Subtotal			31.608	2.052		1.968		1.985		-		1.985	Continuing	Continuing	N/A
Remarks FY 2020 funding supports manpower required for data collection and analysis resulting from field testing.															
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
Developmental Test & Eval	WR	NAWCWD : China Lake, CA	1.004	4.149	Nov 2017	4.093	Nov 2018	4.921	Nov 2019	-		4.921	Continuing	Continuing	Continuing
Prior Year Dev T&E no longer funded in FYDP	Various	Various : Various	18.701	0.000		0.000		0.000		-		0.000	0.000	18.701	-
Subtotal			19.705	4.149		4.093		4.921		-		4.921	Continuing	Continuing	N/A
Remarks FY 2020 funding supports AARGM and HARM field testing and increased laboratory testing enabled by previous investments in AARGM laboratory capabilities.															
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 Support	WR	NAWCAD : Patuxent River, MD	0.000	0.185	Nov 2017	0.185	Nov 2018	0.189	Nov 2019	-		0.189	Continuing	Continuing	Continuing
Travel	WR	Various : Various	0.411	0.010	Oct 2017	0.010	Oct 2018	0.010	Oct 2019	-		0.010	Continuing	Continuing	Continuing
Subtotal			0.411	0.195		0.195		0.199		-		0.199	Continuing	Continuing	N/A

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2020 Navy												<b>Date:</b> March 2019			
<b>Appropriation/Budget Activity</b> 1319 / 7						<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>				<b>Project (Number/Name)</b> 1780 / <i>HARM Improvement</i>					
<b>Management Services (\$ in Millions)</b>				<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Remarks</b> Contract Type for Travel is Travel Order (TO).															
			<b>Prior Years</b>	<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>			51.724	6.396		6.256		7.105		-		7.105	Continuing	Continuing	N/A
<b>Remarks</b>															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy																							Date: March 2019						
Appropriation/Budget Activity 1319 / 7											R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement								Project (Number/Name) 1780 / HARM Improvement										
HARM IMPROVEMENT		FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Acquisition Milestones																													
ARM Steering Committee			ARM SC ▲				ARM SC ▲				ARM SC ▲				ARM SC ▲				ARM SC ▲				ARM SC ▲				ARM SC ▲		
Air Defense Unit System Report		Air Defense Unit System Report																											
Systems Development																													
Lab Development		Lab Development																											
Test & Evaluation																													
ARM Flight Testing																													
ARM Ground Testing																													
Production Milestones																													
Deliveries																													
Tactics Manual Update					▲				▲				▲				▲				▲				▲				▲
User Data File Update					▲				▲				▲				▲				▲				▲				▲
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2020DON - 0205601N - 1780



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<b>Exhibit R-4A, RDT&amp;E Schedule Details: PB 2020 Navy</b>			<b>Date:</b> March 2019
<b>Appropriation/Budget Activity</b> 1319 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>	<b>Project (Number/Name)</b> 1780 / <i>HARM Improvement</i>	

**Schedule Details**

<b>Events by Sub Project</b>	<b>Start</b>		<b>End</b>	
	<b>Quarter</b>	<b>Year</b>	<b>Quarter</b>	<b>Year</b>
<b><i>HARM IMPROVEMENT</i></b>				
Acquisition Milestones: ARM Steering Committee: FY 2018 ARM Steering Committee	2	2018	2	2018
Acquisition Milestones: ARM Steering Committee: FY 2019 ARM Steering Committee	2	2019	2	2019
Acquisition Milestones: ARM Steering Committee: FY 2020 ARM Steering Committee	2	2020	2	2020
Acquisition Milestones: ARM Steering Committee: FY 2021 ARM Steering Committee	2	2021	2	2021
Acquisition Milestones: ARM Steering Committee: FY 2022 ARM Steering Committee	2	2022	2	2022
Acquisition Milestones: ARM Steering Committee: FY 2023 ARM Steering Committee	2	2023	2	2023
Acquisition Milestones: ARM Steering Committee: FY 2024 ARM Steering Committee	2	2024	2	2024
Acquisition Milestones: Air Defense Unit System Report: Air Defense Unit System Report	1	2018	4	2024
Systems Development: Lab Development: Lab Development	2	2018	4	2019
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2018 QTR 3-4	3	2018	4	2018
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2019 QTR 3-4	3	2019	4	2019
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2020 QTR 2-4	2	2020	4	2020
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2021 QTR 2-4	2	2021	4	2021
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2022 QTR 2-4	2	2022	4	2022
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2023 QTR 2-4	2	2023	4	2023
Test & Evaluation: ARM Flight Testing: Flight Testing FY 2024 QTR 2-4	2	2024	4	2024
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2018 QTR 3-4	3	2018	4	2018
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2019 QTR 3-4	3	2019	4	2019
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2020 QTR 2-4	2	2020	4	2020
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2021 QTR 2-4	2	2021	4	2021
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2022 QTR 2-4	2	2022	4	2022

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement		Project (Number/Name) 1780 / HARM Improvement	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2023 QTR 2-4		2	2023	4	2023
Test & Evaluation: ARM Ground Testing: Ground Testing FY 2024 QTR 2-4		2	2024	4	2024
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2018		4	2018	4	2018
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2019		4	2019	4	2019
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2020		4	2020	4	2020
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2021		4	2021	4	2021
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2022		4	2022	4	2022
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2023		4	2023	4	2023
Deliveries: Tactics Manual Update: Tactics Manual Update FY 2024		4	2024	4	2024
Deliveries: User Data File Update: User Data File Update FY 2018		4	2018	4	2018
Deliveries: User Data File Update: User Data File Update FY 2019		4	2019	4	2019
Deliveries: User Data File Update: User Data File Update FY 2020		4	2020	4	2020
Deliveries: User Data File Update: User Data File Update FY 2021		4	2021	4	2021
Deliveries: User Data File Update: User Data File Update FY 2022		4	2022	4	2022
Deliveries: User Data File Update: User Data File Update FY 2023		4	2023	4	2023
Deliveries: User Data File Update: User Data File Update FY 2024		4	2024	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2185 / AARGM			
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
2185: AARGM	721.810	14.798	15.266	11.677	-	11.677	11.192	4.787	4.886	4.985	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 368												
A. Mission Description and Budget Item Justification												
<p>Advanced Anti-Radiation Guided Missile (AARGM) transitioned a Phase III Small Business Innovation Research (SBIR) program to develop and demonstrate a multi-mode guidance section on a High Speed Anti-Radiation Missile (HARM) airframe to System Development and Demonstration (SD&amp;D) in FY 2003. The AARGM SD&amp;D program was designed to integrate multi-mode guidance (passive Anti-Radiation Homing (ARH)/active Millimeter Wave (MMW) Radar/Global Positioning System (GPS)/Inertial Navigation System) on the HARM Air-to-Ground Missile (AGM)-88. Planned AARGM weapon system capabilities include: active MMW terminal guidance, counter shutdown, expanded threat coverage, enhanced ARH, netted targeting real-time feed via Integrated Broadcast System (IBS) prior to missile launch, Weapon Impact Assessment (WIA) transmitted prior to detonation, GPS/point-to-point weapon navigation, enhanced navigational performance in denied environments and weapon employment with impact avoidance zone/missile impact zones.</p>												
<p>The AARGM program includes 40 SD&amp;D test articles with the follow on of 2,435 production modification kits. Milestone C was achieved 4Q FY 2008, followed by a combined FY 2008/FY 2009 Low Rate Initial Production (LRIP) contract award in 1Q FY 2009. Developmental testing was completed in 2009. Initial Operational Test and Evaluation (IOT&amp;E) was completed in 3Q FY 2012. Full-Rate Production (FRP) decision was received 4 September 2012 with FRP contract award on 10 September 2012, and deliveries began in January 2014.</p>												
<p>The AARGM Block 1 Upgrade program began in FY 2012 and consists of a software only upgrade to deferred Key Performance Parameter 3 and to correct IOT&amp;E deficiencies in the AGM-88E All-Up-Round as well as the Common Munitions Built-in Test (BIT) Reprogramming Equipment (CMBRE).</p>												
<p>Follow-on Operational Test and Evaluation/Integrated Test (FOT&amp;E/IT) of the Block 1 Upgrade completed with Fleet Release approval in July 2017 and completion in January 2018.</p>												
<p>In FY 2020 - FY 2024, the AARGM program plans to continue to develop and demonstrate the capability to engage and destroy non-traditional and Overseas Contingency Operations targets. These developments continue Future Naval Capability Science and Technology investments by the Office of Naval Research initiated in FY 2006. Over this same timeframe, the AARGM program will develop or enhance navigational capability in denied environments.</p>												
<p>FY 2020 funding continues to support AARGM's advanced development and system capability upgrades. Additional funding will support the implementation of M Code, AARGM Derivative Program and upgrades to the radio frequency data processing to meet emerging requirements.</p>												

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Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement		Project (Number/Name) 2185 / AARGM		
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>		<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>	<b>FY 2020 OCO</b>	<b>FY 2020 Total</b>
<b>Title:</b> Threat Data Library / System Updates		2.230	1.200	1.224	0.000	1.224
<b>Articles:</b>		-	-	-	-	-
<b>FY 2019 Plans:</b> AGM-88E continues effort to upgrade and prioritize Electronic Intelligence files. Continue test and assessment of threat systems that impact already fielded weapons and to develop threat data for new target sets. Plans also include development or enhancement of navigational capability, integration of modernized Anti-Radiation Homing processor, and human system interface improvements to mission planning.						
<b>FY 2020 Base Plans:</b> AGM-88E continues effort to upgrade and prioritize Electronic Intelligence files. Continue test and assessment of threat systems that impact already fielded weapons and to develop threat data for new target sets. Plans also include development or enhancement of navigational capability, integration of modernized Anti-Radiation Homing processor, and human system interface improvements to mission planning.						
<b>FY 2020 OCO Plans:</b> N/A						
<b>FY 2019 to FY 2020 Increase/Decrease Statement:</b> FY 2019 to FY 2020 increase due to continuation of Threat Data Library / System Updates.						
<b>Title:</b> Follow-on Operational Test and Evaluation (FOT&E) and Correction of Deficiencies		0.475	0.484	0.494	0.000	0.494
<b>Articles:</b>		-	-	-	-	-
<b>FY 2019 Plans:</b> Continue to upgrade the system with test results to include developmental activity assessing software and hardware anomalies. Testing for those efforts in System Updates includes navigational T&E, processor performance evaluations, and includes verification and validation for correction of deficiencies from Block 0 and Block 1 testing.						
<b>FY 2020 Base Plans:</b> Continue to upgrade the system with test results to include developmental activity assessing software and hardware anomalies. Testing for those efforts in System Updates includes navigational T&E, processor performance evaluations, and includes verification and validation for E2 hardware changes and Block 1A testing.						
<b>FY 2020 OCO Plans:</b> N/A						
<b>FY 2019 to FY 2020 Increase/Decrease Statement:</b>						

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Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement	Project (Number/Name) 2185 / AARGM			
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 to FY 2020 increase due to continued execution of AARGM FOT&E and Correction of Deficiencies efforts.						
Title: Advanced Development		12.093	13.582	9.959	0.000	9.959
Articles:		-	-	-	-	-
FY 2019 Plans: Enhance navigational capability to comply with requirement to implement M-Code to comply with U.S. Statute. Award the M Code Integration & Test contract. Funding supports upgrade of the radio frequency data processing to meet emerging requirements. Funding supports the transition of receiver technology upgrades in coordination with the Office of Naval Research (ONR) project ALPO. Funding supports testing, configuration control board review, test plan reviews, requirements analysis and weapons integration analysis. Funding supports upgrading AGM-88E capability against non-traditional and OCO targets. This includes weapon system developmental activities, range and laboratory support and analysis. In FY 2019, the AARGM program plans to develop and demonstrate the capability to engage and destroy non-traditional and Overseas Contingency Operations targets.						
FY 2020 Base Plans: Enhance navigational capability to comply with requirement to implement M-Code to comply with U.S. Statute. Continue M Code Integration & Testing and continued upgrade of the radio frequency data processing to meet emerging requirements by updating the Block 1A missile software to add Complex Emitters, AARGM Derivative Program (ADP), M-Code, and Reprogramming Capability. Funding supports the continued transition of receiver technology upgrades in coordination with the Office of Naval Research (ONR) project ALPO. Efforts specifically include testing, configuration control board reviews, test plan reviews, requirements analysis and weapons integration analysis. This project supports an upgraded AGM-88E capability against non-traditional and OCO targets. Effort in support of this requirement includes weapon system developmental activities, range and laboratory support and analysis. In FY 2020, the AARGM program plans to continue to develop and demonstrate the capability to engage and destroy non-traditional and Overseas Contingency Operations targets.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of funding from FY 2019 to FY 2020 is due to the phasing of the M-Code Development and AARGM Derivative Program efforts.						
Accomplishments/Planned Programs Subtotals		14.798	15.266	11.677	0.000	11.677

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2020 Navy							<b>Date:</b> March 2019		
<b>Appropriation/Budget Activity</b> 1319 / 7				<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>			<b>Project (Number/Name)</b> 2185 / <i>AARGM</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>
• WPN 2327: <i>HARM Mods</i>	183.368	179.885	183.740	-	183.740	188.073	175.142	178.658	0.000	0.000	1,920.301

**Remarks**

FY 2021 - FY 2024 Total Cost funding listed does not include the Advanced Anti-Radiation Guided Missile Extended Range funding.

**D. Acquisition Strategy**

The AARGM program started as a Phase I Small Business Innovative Research (SBIR), Advanced Technology Program, evolved into a Phase III SBIR program, and transitioned into a System Development and Demonstration (SD&D) Acquisition Category 1C program in June 2003. The AARGM SD&D met most U.S. Navy operational requirements. AARGM Advanced Technology Development and Quick Bolt Advanced Concept Technology Demonstration demonstrated possible future system enhancements. AARGM Block 1 fulfills the rest of the operational requirements. Block 1 Fleet Release was approved in 4Q FY 2017. ONR Future Naval Capability AARGM Derivative Program (ADP) Program to transition in FY 2019. Expand target set capability and add M-code in FY 2018 - FY 2024.

**E. Performance Metrics**

Block 1 Fleet Release complete 2Q FY 2018. ADP Transition FY 2019. M-Code capable FY 2021. ADP and Complex Emitter Capable FY 2022.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2185 / AARGM					
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
Primary Hardware Development	SS/CPFF	Northrop Grumman Corporation Innovation Systems : Northridge, CA	0.000	9.049	Dec 2017	0.000		0.000		-		0.000	0.000	9.049	-
Systems Engineering	WR	NAWCWD : China Lake, CA	83.472	2.055	Nov 2017	1.016	Nov 2018	1.036	Nov 2019	-		1.036	Continuing	Continuing	Continuing
M Code	SS/IDIQ	Northrop Grumman Corporation Innovation Systems : Northridge, CA	0.000	1.000	Mar 2018	0.900	Jun 2019	0.000		-		0.000	Continuing	Continuing	Continuing
Software Development (Block 1A)	SS/IDIQ	Northrop Grumman Corporation Innovation Systems : Northridge, CA	0.000	1.026	Mar 2018	9.473	Dec 2018	6.780	Dec 2019	-		6.780	Continuing	Continuing	Continuing
Mission Planning	WR	Various : Various	0.833	0.100	Mar 2018	0.100	Mar 2019	0.100	Mar 2020	-		0.100	Continuing	Continuing	Continuing
Prior year Prod Dev no longer funded in the FYDP	Various	Various : Various	544.279	0.000		0.000		0.000		-		0.000	0.000	544.279	-
Subtotal			628.584	13.230		11.489		7.916		-		7.916	Continuing	Continuing	N/A
Remarks															
FY 2020 Product Development funding planned to continue to support Radio Frequency (RF) Processor firmware, RF Processor software, A2 Card firmware, the transition of the ONR Future Naval Capability Project ALPO into the program of record AARGM Derivative Program (ADP) and Missile Software (Block 1A) development efforts.															
"Orbital ATK" Performing Activity renamed to "Northrop Grumman Corporation Innovation Systems."															
Support (\$ 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
Prior year Support no longer funded in the FYDP	Various	Various : Various	7.147	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			7.147	0.000		0.000		0.000		-		0.000	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2185 / AARGM					
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
Development Test & Evaluation	WR	NAWCWD : China Lake, CA	26.433	0.528	Nov 2017	0.429	Nov 2018	0.437	Nov 2019	-		0.437	Continuing	Continuing	Continuing
Operational and Integrated Test & Evaluation (IT&OT)	WR	NAWCWD : China Lake, CA	12.772	0.000		2.300	Jun 2019	0.100	Nov 2019	-		0.100	Continuing	Continuing	Continuing
Operational and Integrated Test & Evaluation (IT&OT)	SS/IDIQ	Northrop Grumman Corporation Innovation Systems : Northridge, CA	1.342	0.000		0.000		2.158	Dec 2019	-		2.158	Continuing	Continuing	Continuing
Prior year T&E no longer funded in the FYDP	Various	Various : Various	24.929	0.000		0.000		0.000		-		0.000	0.000	24.929	-
Subtotal			65.476	0.528		2.729		2.695		-		2.695	Continuing	Continuing	N/A
Remarks															
FY 2020 funding is for continued IT&OT to support testing required for M Code integration and Block 1A.															
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 Support	Various	Various : Various	5.136	0.250	Feb 2018	0.250	Feb 2019	0.255	Feb 2020	-		0.255	Continuing	Continuing	Continuing
Travel	WR	NAVAIR HQ : Patuxent River, MD	1.778	0.015	Oct 2017	0.015	Oct 2018	0.015	Oct 2019	-		0.015	Continuing	Continuing	Continuing
Government Engineering Support	WR	NAWCAD : Patuxent River, MD	2.639	0.575	Nov 2017	0.583	Nov 2018	0.596	Nov 2019	-		0.596	Continuing	Continuing	Continuing
Program Management Support	Various	NRO : Washington, D.C.	0.800	0.200	Nov 2017	0.200	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	Continuing
Prior year Mgmt no longer funded in the FYDP	Various	Various : Various	10.250	0.000		0.000		0.000		-		0.000	0.000	10.250	-
Subtotal			20.603	1.040		1.048		1.066		-		1.066	Continuing	Continuing	N/A
Remarks															
Contract Type for Travel is TO.															



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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy											Date: March 2019			
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement					Project (Number/Name) 2185 / AARGM				
	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	721.810	14.798		15.266		11.677		-		11.677	Continuing	Continuing	N/A	

Remarks

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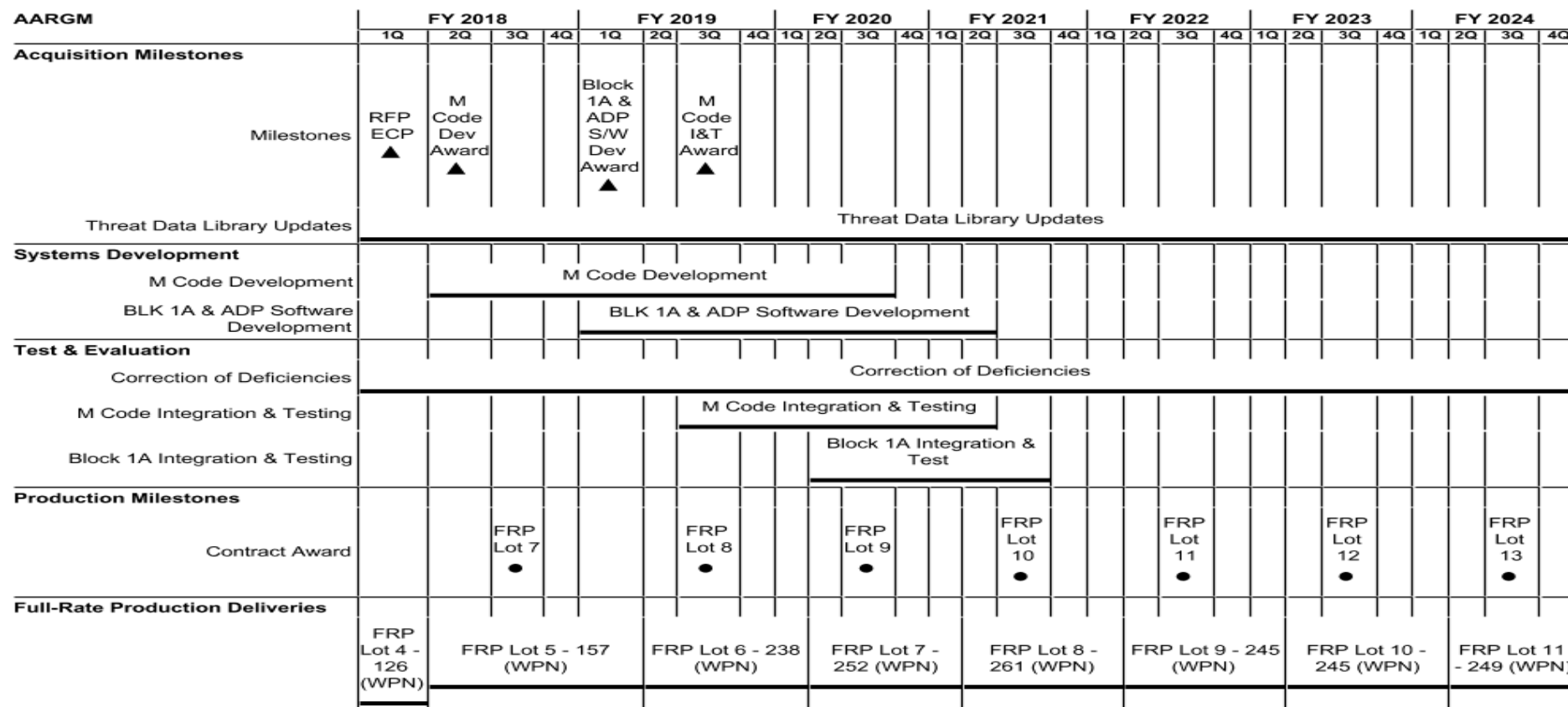
**Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy**

**Date:** March 2019

**Appropriation/Budget Activity**  
1319 / 7

**R-1 Program Element (Number/Name)**  
PE 0205601N / *Harm Improvement*

**Project (Number/Name)**  
2185 / AARGM



2020PB - 0205601N - 2185

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2020 Navy			<b>Date:</b> March 2019
<b>Appropriation/Budget Activity</b> 1319 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>	<b>Project (Number/Name)</b> 2185 / <i>AARGM</i>	

**Schedule Details**

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>AARGM</b>				
Acquisition Milestones: Milestones: Radio Frequency Processor Upgrade	1	2018	1	2018
Acquisition Milestones: Milestones: M Code Dev Award	2	2018	2	2018
Acquisition Milestones: Milestones: Block 1A & ADP S/W Dev Award	1	2019	1	2019
Acquisition Milestones: Milestones: M Code I&T Award	3	2019	3	2019
Acquisition Milestones: Threat Data Library Updates: Threat Data Library Updates	1	2018	4	2024
Systems Development: M Code Development: M Code Development	2	2018	3	2020
Systems Development: BLK 1A & ADP Software Development: BLK 1A & ADP Software Development	1	2019	2	2021
Test & Evaluation: Correction of Deficiencies: Correction of Deficiencies	1	2018	4	2024
Test & Evaluation: M Code Integration & Testing: M Code Integration & Testing	3	2019	2	2021
Test & Evaluation: Block 1A Integration & Testing: Block 1A Integration & Testing	2	2020	3	2021
Production Milestones: Contract Award: Full-Rate Production Lot 7	3	2018	3	2018
Production Milestones: Contract Award: Full-Rate Production Lot 8	3	2019	3	2019
Production Milestones: Contract Award: Full-Rate Production Lot 9	3	2020	3	2020
Production Milestones: Contract Award: Full-Rate Production Lot 10	3	2021	3	2021
Production Milestones: Contract Award: Full-Rate Production Lot 11	3	2022	3	2022
Production Milestones: Contract Award: Full-Rate Production Lot 12	3	2023	3	2023
Production Milestones: Contract Award: Full-Rate Production Lot 13	3	2024	3	2024
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 4 (WPN)	1	2018	1	2018
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 5 (WPN)	2	2018	1	2019
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 6 (WPN)	2	2019	1	2020
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 7 (WPN)	2	2020	1	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement		Project (Number/Name) 2185 / AARGM	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 8 (WPN)		2	2021	1	2022
Full-Rate Production Deliveries: Full-Rate Production Delieveries - Lot 9 (WPN)		2	2022	1	2023
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 10 (WPN)		2	2023	1	2024
Full-Rate Production Deliveries: Full-Rate Production Deliveries - Lot 11 (WPN)		2	2024	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy										Date: March 2019		
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2189 / AARGM ER			
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
2189: AARGM ER	38.317	49.221	99.240	119.649	-	119.649	49.605	34.825	42.249	48.225	Continuing	Continuing
Quantity of RDT&E Articles		-	15	2	-	2	-	-	-	-		

## A. Mission Description and Budget Item Justification

The Air-to-Ground (AGM)-88 Extended Range (ER) Upgrade was a new start in FY 2016. The purpose of this effort is to develop hardware and software modifications to improve the Advanced Anti-Radiation Guided Missile (AARGM)'s operational capabilities, including extended range, survivability and effectiveness against complex, new, and emerging threats. This budget line item funds a new rocket motor design, system development and integration, test asset procurement, testing, and associated software updates for the AARGM-ER to ensure these capabilities perform in accordance with established requirements. FY 2020 activities include continuation of the Engineering & Manufacturing Development (EMD) phase, initiation of Developmental Test & Evaluation, and the commencement of test articles delivery. AARGM-ER retains the same guidance, sensor, and warhead capabilities of the AARGM.

The AARGM-ER program is part of the Navy's Integrated Fire Control (IFC) approach to address advanced threat capabilities in the Anti-Access/Area-Denial (A2/AD) environment. IFC solutions enable individual system capabilities to be leveraged across an effects chain, placing the full spectrum of tactical capability in the hands of the warfighter. IFC solutions that push engagement distances beyond the launch platform's radar horizon and allows the U.S. Navy to operate in, and control, contested battle space in littoral waters and A2/AD environments are increasingly critical as more scenarios require compressed and coordinated fire control timelines.

AARGM-ER is a capability-based acquisition program and has been structured to meet the CNO's urgency mandate to deliver warfighting capability as soon as possible.

## B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<b>Title:</b> AARGM ER Development	49.221	99.240	119.649	0.000	119.649
<b>Articles:</b>	-	15	2	-	2
<b>FY 2019 Plans:</b>					
FY 2019 activities include completion of the Missile Section Integration contract and contract award for the Engineering & Manufacturing Development phase to include procurement of test articles. Execute Knowledge Point 2 and complete a Preliminary Design Review. Continue range safety analysis for telemetry section Flight Termination System development. Funding supports upgrading capability to process and target non-traditional and advanced signals. This includes weapon system developmental activities, range and laboratory support and analysis.					
<b>FY 2020 Base Plans:</b>					
FY 2020 activities include continuation of the Engineering and Manufacturing Development contract and commencement of aircraft integration. Execute Knowledge Point 3 and complete a Critical Design Review. Test & evaluation of software for the guidance section will continue in support of functional ground and flight testing.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement	Project (Number/Name) 2189 / AARGM ER	

## B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Preliminary Flight Rating Test events will assess rocket motor performance in advance of first free flight events in FY21. Jettison and safe separation flights will assess the weapons autopilot in various environments where the missile is separating from the host aircraft. Begin rocket motor qualification. Flight test planning for captive carriage of training missiles begins. Continuation of build of test articles for analysis and qualification.					
<b>FY 2020 OCO Plans:</b> N/A					
<b>FY 2019 to FY 2020 Increase/Decrease Statement:</b> Increase of funding from FY 2019 to FY 2020 is due to the commencement of Developmental Test & Evaluation and the commencement of aircraft integration.					
<b>Accomplishments/Planned Programs Subtotals</b>	49.221	99.240	119.649	0.000	119.649

## 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
• WPN 2327: HARM Mods	0.000	0.000	0.000	-	0.000	30.000	30.662	31.275	214.125	1,432.469	1,738.531

### Remarks

FY 2021 - FY 2024 and Total Cost funding listed does not include the AARGM Block 1 funding.

## D. Acquisition Strategy

The AARGM Extended Range Program will provide hardware and software modifications to improve AARGM's operational capabilities, including extended range, survivability, and effectiveness against complex, new, and emerging threats. The program's objective requirement for Initial Operational Capability is FY 2023.

## E. Performance Metrics

AARGM-ER activities to support a Knowledge Point 2 in FY 2019 and a Knowledge Point 3 in FY 2020. KP-2 is equivalent to a Milestone B approval. KP-3 is a Critical Design Review (CDR) type event.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2189 / AARGM ER					
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
Rocket Motor Risk Initiative	WR	NAWCWD : China Lake, CA	0.447	0.500	Nov 2017	0.000		0.000		-		0.000	0.000	0.947	-
Rocket Motor Risk Initiative	WR	NSWC : Indian Head, MD	0.500	0.500	Dec 2017	0.000		0.000		-		0.000	0.000	1.000	-
Front End Design Analysis	SS/CPFF	Northrop Grumman Corporation Innovation Systems : Northridge, CA	13.095	2.126	Oct 2017	0.000		0.000		-		0.000	0.000	15.221	15.221
Missile Section Integration	SS/CPFF	Northrop Grumman Corporation Innovation Systems : Northridge, CA	6.578	34.465	Jan 2018	15.165	Oct 2018	0.000		-		0.000	0.000	56.208	44.464
Engineering & Manufacturing Development	SS/CPIF	Northrop Grumman Corporation Innovation Systems : Northridge, CA	0.000	0.000		35.335	Feb 2019	77.240	Dec 2019	-		77.240	Continuing	Continuing	Continuing
Aircraft Integration	WR	NAWCWD : China Lake, CA	0.884	0.023	Jan 2018	6.000	Jan 2019	10.050	Nov 2019	-		10.050	Continuing	Continuing	Continuing
Aircraft Integration	TBD	Boeing : St. Louis, MO	0.000	0.000		1.000	May 2019	6.000	Nov 2019	-		6.000	0.000	7.000	-
Systems Engineering	WR	NAWCWD : China Lake, CA	8.077	5.356	Nov 2017	6.146	Nov 2018	6.269	Nov 2019	-		6.269	Continuing	Continuing	Continuing
Systems Engineering	WR	NAWCAD : Patuxent River, MD	1.466	1.900	Nov 2017	3.379	Nov 2018	3.447	Nov 2019	-		3.447	Continuing	Continuing	Continuing
Telemetry Section	WR	NAWCWD : China Lake, CA	0.200	0.204	Nov 2017	2.184	Nov 2018	2.184	Nov 2019	-		2.184	Continuing	Continuing	Continuing
Subtotal			31.247	45.074		69.209		105.190		-		105.190	Continuing	Continuing	N/A
Remarks															
FY 2020 activities include execution of the Engineering & Manufacturing Development phase.															
"Orbital ATK" Performing Activity renamed to "Northrop Grumman Corporation Innovation Systems.															
Engineering & Manufacturing Development Contract will ramp up to support aircraft integration testing, rocket motor preliminary flight rating qualification, and weapon software development.															

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy												Date: March 2019			
Appropriation/Budget Activity 1319 / 7						R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement				Project (Number/Name) 2189 / AARGM ER					
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
Aircraft Integration (NAWCWD) will ramp up to support the F/A-18 H18 software build.															
Aircraft Integration (Boeing) will ramp up with aircraft interface software development and testing.															
Support (\$ 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
Studies & Analysis	Various	Various : Various	3.606	2.328	Nov 2017	0.500	Mar 2019	0.000		-		0.000	0.000	6.434	-
Subtotal			3.606	2.328		0.500		0.000		-		0.000	0.000	6.434	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
Developmental Test & Evaluation	WR	NAWCAD : Patuxent River, MD	0.000	0.000		1.550	Nov 2018	5.230	Apr 2020	-		5.230	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NAWCWD : China Lake, CA	0.000	0.000		0.000		3.217	Apr 2020	-		3.217	0.000	3.217	-
ER Test Assets	TBD	Northrop Grumman Corporation Innovation Systems : Northridge, CA	0.000	0.000		25.500	Feb 2019	3.468	Nov 2019	-		3.468	0.000	28.968	25.500
T&E Support	WR	COTF : Norfolk, VA	0.050	0.000		0.200	Nov 2018	0.204	Nov 2019	-		0.204	0.000	0.454	-
Operational and Integrated T&E	WR	Various : Various	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Subtotal			0.050	0.000		27.250		12.119		-		12.119	Continuing	Continuing	N/A
Remarks															
Developmental Test & Evaluation (NAWCAD) will increase to obtain a flight clearance, perform airborne store separation testing, and interoperability testing with the Next Generation Jammer Mid-Band (NGJ-MB) system on the EA-18G Growler platform.															
Developmental Test & Evaluation (NAWCWD) will increase due to missile aircraft interface and arena testing for the warhead.															



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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2020 Navy</b>													<b>Date:</b> March 2019		
<b>Appropriation/Budget Activity</b> 1319 / 7						<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>				<b>Project (Number/Name)</b> 2189 / <i>AARGM ER</i>					
<b>Test and Evaluation (\$ in Millions)</b>				<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
15 Test articles were procured in FY 2019 and 2 test articles will be procured in FY2020. All Up Round test assets support testing on the F/A-18 E/F and EA-18G including captive carry and missile free flight test events. Testing is required to address environmental and aeromechanical design considerations for the missile and aircraft integration. Testing is also required to evaluate missile guidance and control characteristics and validate free flight performance.															
<b>Management Services (\$ in Millions)</b>				<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Program Management Support	Various	Various : Various	1.663	1.139	Nov 2017	1.161	Nov 2018	1.184	Nov 2019	-		1.184	Continuing	Continuing	Continuing
Program Management Support	WR	NAWCAD : Patuxent River, MD	1.697	0.600	Nov 2017	1.025	Nov 2018	1.046	Nov 2019	-		1.046	Continuing	Continuing	Continuing
Government Engineering & Information Technology Support	WR	NSWC : Dahlgren, VA	0.037	0.030	Oct 2017	0.035	Oct 2018	0.040	Oct 2019	-		0.040	Continuing	Continuing	Continuing
Travel	WR	NAVAIR HQ : Patuxent River, MD	0.017	0.050	Nov 2017	0.060	Nov 2018	0.070	Nov 2019	-		0.070	Continuing	Continuing	Continuing
<b>Subtotal</b>			3.414	1.819		2.281		2.340		-		2.340	Continuing	Continuing	N/A
			<b>Prior Years</b>	<b>FY 2018</b>		<b>FY 2019</b>		<b>FY 2020 Base</b>		<b>FY 2020 OCO</b>		<b>FY 2020 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>			38.317	49.221		99.240		119.649		-		119.649	Continuing	Continuing	N/A
<b>Remarks</b>															

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

**Date:** March 2019

**Appropriation/Budget Activity**

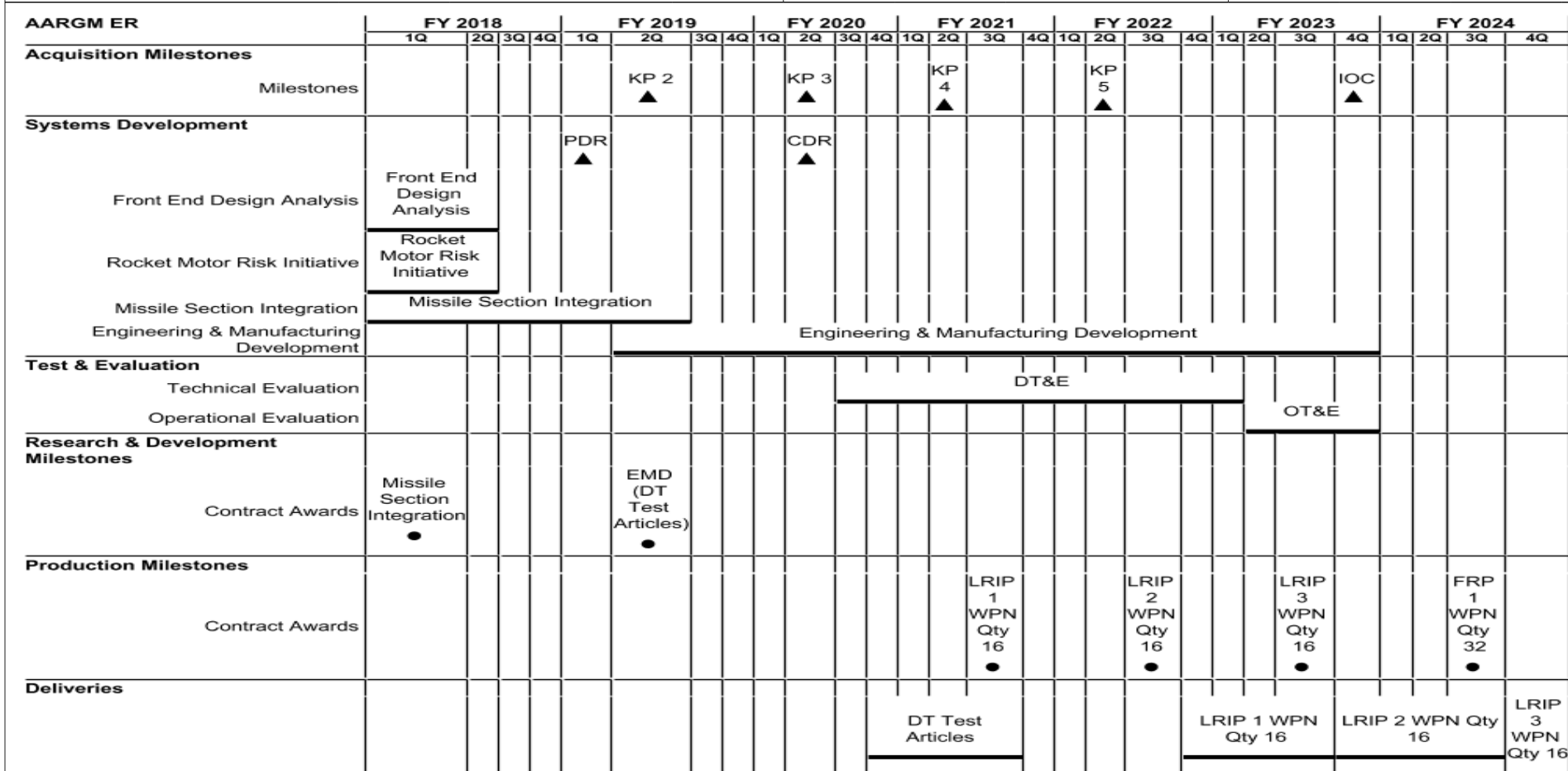
1319 / 7

**R-1 Program Element (Number/Name)**

PE 0205601N / *Harm Improvement*

**Project (Number/Name)**

2189 / *AARGM ER*



2020PB - 0205601N - 2189

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2020 Navy			<b>Date:</b> March 2019
<b>Appropriation/Budget Activity</b> 1319 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0205601N / <i>Harm Improvement</i>	<b>Project (Number/Name)</b> 2189 / <i>AARGM ER</i>	

**Schedule Details**

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>AARGM ER</b>				
Acquisition Milestones: Milestones: Knowledge Point 2	2	2019	2	2019
Acquisition Milestones: Milestones: Knowledge Point 3	2	2020	2	2020
Acquisition Milestones: Milestones: Knowledge Point 4	2	2021	2	2021
Acquisition Milestones: Milestones: Knowledge Point 5	2	2022	2	2022
Acquisition Milestones: Milestones: IOC	4	2023	4	2023
Systems Development: Preliminary Design Review (PDR)	1	2019	1	2019
Systems Development: Critical Design Review (CDR)	2	2020	2	2020
Systems Development: Front End Design Analysis: Front End Design Analysis	1	2018	2	2018
Systems Development: Rocket Motor Risk Initiative: Rocket Motor Risk Initiative	1	2018	2	2018
Systems Development: Missile Section Integration: Missile Section Integration	1	2018	2	2019
Systems Development: Engineering & Manufacturing Development: Engineering & Manufacturing Development	2	2019	4	2023
Test & Evaluation: Technical Evaluation: Developmental Test & Evaluation	3	2020	1	2023
Test & Evaluation: Operational Evaluation: Operational Test & Evaluation	2	2023	4	2023
Research & Development Milestones: Contract Awards: Missile Section Integration	1	2018	1	2018
Research & Development Milestones: Contract Awards: Engineering & Manufacturing Development (DT Test Articles)	2	2019	2	2019
Production Milestones: Contract Awards: LRIP 1 WPN Qty 16	3	2021	3	2021
Production Milestones: Contract Awards: LRIP 2 WPN Qty 16	3	2022	3	2022
Production Milestones: Contract Awards: LRIP 3 WPN Qty 16	3	2023	3	2023
Production Milestones: Contract Awards: FRP 1 WPN Qty 32	3	2024	3	2024
Deliveries: DT Test Articles	4	2020	3	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy			Date: March 2019		
Appropriation/Budget Activity 1319 / 7		R-1 Program Element (Number/Name) PE 0205601N / Harm Improvement		Project (Number/Name) 2189 / AARGM ER	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Deliveries: LRIP 1 WPN Qty 16		4	2022	3	2023
Deliveries: LRIP 2 WPN Qty 16		4	2023	3	2024
Deliveries: LRIP 3 WPN Qty 16		4	2024	4	2024