Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607142A *I Aviation Rocket System Product Improvement and Development*

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	-	9.662	38.452	24.221	-	24.221	17.171	13.608	11.066	3.000	Continuing	Continuing
EW9: *Aviation Rocket System Product Improvement and Dev*	-	9.662	38.452	24.221	-	24.221	17.171	13.608	11.066	3.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Aviation Rockets and Small Guided Munitions Product Improvement and Development line funds the development, integration and test of current and future munitions and launchers, and their interface to platforms. Additionally, it will fund a range of improvement initiatives to modernize the Hydra-70 2.75 Inch rocket and launcher system. The current Hydra-70 2.75 inch rocket system requires performance improvements to comply with 1) US Code - Title 10, Chapter 141, Section 2389 "Ensuring Safety regarding Insensitive Munitions", 2) Department of Defense (DoD) Directive 5000.1, Chairman of the Joint Chiefs of Staff (CJCS) Instruction 3170.01C, Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD (AT&L)) Memorandum of January 26, 1999, "Exemption for Existing Inventory Items to Insensitive Munitions (IM) Requirements", 3) validated Lightweight Precision Munition (LPM) Operational Needs Statement (ONS) 16-21556 and 15 Dec 2017 Directed Requirement, 4) signed Initial Capability Document for Army Aviation Weapons, Sub systems and Munitions (AAWSSM), and 5) existing/emerging Headquarters, Department of the Army (HQDA) G-3/5/7 and U.S. Army Training and Doctrine Command (TRADOC) aviation weapon requirements for guided and unguided rocket systems. Improvements to existing rocket systems and munitions will include design, qualification and integration of precision guidance capability, increased lethality, improved target suppression, increased standoff range, reduced minimum engagement range, improved pre-launch constraints and munitions communications/programmability, increased stowed kills, increased product reliability, improved hardness against unplanned stimuli, reduced war fighter workload, and reduced environmental impact for both manned and unmanned applications.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	10.064	60.860	24.221	-	24.221
Current President's Budget	9.662	38.452	24.221	-	24.221
Total Adjustments	-0.402	-22.408	0.000	-	0.000
• Congressional General Reductions	-0.008	-0.048			
• Congressional Directed Reductions	-	-22.360			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.394	-			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607142A / *Aviation Rocket System Product Improvement and Development*	Project (Number/Name) EW9 / *Aviation Rocket System Product Improvement and Dev*	

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
EW9: *Aviation Rocket System Product Improvement and Dev*	-	9.662	38.452	24.221	-	24.221	17.171	13.608	11.066	3.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Aviation Rockets and Small Guided Munitions Product Improvement and Development line funds the development, integration and test of current and future munitions and launchers, and their interface to platforms. Additionally, it will fund a range of improvement initiatives to modernize the Hydra-70 2.75 Inch rocket and launcher system. The current Hydra-70 2.75 inch rocket system requires performance improvements to comply with 1) US Code - Title 10, Chapter 141, Section 2389 "Ensuring Safety regarding Insensitive Munitions", 2) Department of Defense (DoD) Directive 5000.1, Chairman of the Joint Chiefs of Staff (CJCS) Instruction 3170.01C, Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD (AT&L)) Memorandum of January 26, 1999, "Exemption for Existing Inventory Items to Insensitive Munitions (IM) Requirements", 3) validated Lightweight Precision Munition (LPM) Operational Needs Statement (ONS) 16-21556 and 15 Dec 2017 Directed Requirement, 4) signed Initial Capability Document for Army Aviation Weapons, Sub systems and Munitions (AAWSSM), and 5) existing/emerging Headquarters, Department of the Army (HQDA) G-3/5/7 and U.S. Army Training and Doctrine Command (TRADOC) aviation weapon requirements for guided and unguided rocket systems. Improvements to existing rocket systems and munitions will include design, qualification and integration of precision guidance capability, increased lethality, improved target suppression, increased standoff range, reduced minimum engagement range, improved pre-launch constraints and munitions communications/programmability, increased stowed kills, increased product reliability, improved hardness against unplanned stimuli, reduced war fighter workload, and reduced environmental impact for both manned and unmanned applications.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Guided Air-to-Ground Rockets (AGR) variants (Advanced Precision Kill Weapon System (APKWS))	0.482	0.608	1.499	-	1.499
Description: These funds will be used to optimize AGR-19 / AGR-20 / ARG-21 integration on the Apache and for activities required to obtain an Army Full Materiel Release (FMR) for AGR-19 / AGR-20 / ARG-21. This effort will include design and build of all-up-round (AUR) containers and test assets, conduct environmental qualification testing, perform ground firings, update aviation platform software, support Apache weapon survey firings, provide technical support to platform integration and testing, and development and revision of training/ maintenance materiel.					
FY 2019 Plans: Complete Full Material Release (FMR) efforts and analysis needed to optimize fire control integration on the AH-64 for guided variants. Continue APKWS Insensitive Munition (IM) All Up Round (AUR) container.					
FY 2020 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607142A / *Aviation Rocket System Product Improvement and Development*	**Project (Number/Name)** EW9 / *Aviation Rocket System Product Improvement and Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue efforts to optimize fire control integration on the AH-64 Apache for guided variants. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to FMR and containers activities completion.					
Title: Modernized Rocket Launcher Increment 1 ***Description:*** This effort provides the interface with aircraft and emerging munitions utilizing non-proprietary, open systems architecture allowing easy compatibility when integrating with aircrafts. This inherent flexibility of an open architecture serves as a building block for future weapons systems and is the basis for an Integrated Munitions Launcher (IML). This effort evaluates launcher-to-munition electrical and mechanical interfaces for a fully capable smart munition and launcher system for the legacy fleet, as well as reduces both programmatic and technical risk. The effort informs requirements for a government owned, non-proprietary physical interface definition. ***FY 2019 Plans:*** Perform technical performance assessments, concept studies, and prepare documentation in effort to merge Modernized Rocket Launcher (MRL) and Smart Digital Interface (SDI) efforts into a single, universal capability. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funds were realigned to the Integrated Munitions Launcher (IML) effort to support the merger of Modernized Rocket Launcher (MRL) and Smart Digital Interface (SDI) for programmatic reasons.	1.164	11.127	-	-	-
Title: Smart Digital Interface ***Description:*** The Smart Digital Interface program is an effort to support both the LPM Directed Requirement and the future smart, two-way digital communications capability to be included in the fully capable Integrated Munitions Launcher (IML). This effort will evaluate launcher-to-munition physical interface technologies for the fully capable smart munition and launcher system to reduce both programmatic and technical risk, as well as to inform requirements for a government owned, nonproprietary physical interface definition. ***FY 2019 Plans:*** Continue phase 2 test asset development/procurement and testing. ***FY 2019 to FY 2020 Increase/Decrease Statement:***	8.016	0.155	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607142A / *Aviation Rocket System Product Improvement and Development*	**Project (Number/Name)** EW9 / *Aviation Rocket System Product Improvement and Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Funds were realigned to the Integrated Munitions Launcher (IML) effort to support the merger of MRL and SDI for programmatic reasons.					
Title: Army aviation weapons ***Description:*** These funds will be used for Army Aviation modular weapon systems and their interface to launchers and platforms. These efforts will include technical assessments, concept studies, perform risk reduction efforts, technology maturation, demonstration, engineering design, engineering / manufacturing development, test, integration and document preparation for Army Aviation manned and unmanned platforms. Evaluation of the Smart Digital Interface technologies will be leveraged to facilitate satisfaction of Lightweight Precision Munition (LPM) ONS and Directed Requirement. The LPM efforts will be utilized to identify deficiencies and define future requirements to include the Army Aviation Weapons, Sub-systems and Munitions (AAWSSM) Capability Development Document. ***FY 2019 Plans:*** 1. Perform technical assessments, concept studies, perform risk reduction efforts and prepare appropriate documentation for emerging Army Aviation Weapons, Sub-systems and Munitions (AAWSM) Initial Capability Document requirements. 2. Begin Lightweight Precision Munition (LPM) technology maturity and risk reduction efforts with industry to include fabrication of munition/launch system prototypes, evaluate mature existing systems to meet validated ONS 16-21556, integration and test efforts on the MQ-1C Gray Eagle. ***FY 2020 Base Plans:*** 1. Continue technical assessments, concept studies, perform risk reduction efforts and prepare appropriate documentation for emerging AAWSSM. Initial Capability Document requirements. 2. Continue LPM technology maturity and risk reduction efforts with industry to include fabrication of munition/ launch system prototypes, evaluate mature existing systems to meet validated ONS 16-21556 and 15 Dec 2017 Directed Requirement, integration and test efforts on the MQ-1C Gray Eagle. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to completion of necessary activities.	-	24.434	2.004	-	2.004
Title: Integrated Munitions Launcher ***Description:*** These funds will be used to design, develop, and qualify a future launcher with standard interfaces to support current and future munitions outlined in the Army Aviation Weapons, Sub Systems and Munitions	-	-	20.718	-	20.718

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607142A / *Aviation Rocket System Product Improvement and Development*	**Project (Number/Name)** EW9 / *Aviation Rocket System Product Improvement and Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(AAWSSM) Initial Capability Document (ICD), dated 17 July 2018. This effort is a continuation of Modernized Rocket Launcher Increment 1 and Smart Digital Interface efforts; merging these efforts will allow the government to align technology enabling solutions with the AAWSSM ICD, maturing technological developments of Integrated Munitions Launcher (IML) prototypes at the subsystem level to mitigate Apache helicopter and Gray Eagle Unmanned Aerial System launcher obsolescence limitations. The Integrated Munitions Launcher (IML) effort will define and provide the interface between aircraft and emerging munitions utilizing a non-proprietary, open systems architecture allowing easy compatibility when integrating on to aviation platforms. The inherent flexibility of an open architecture serves as a building block for future weapons systems. This effort includes the design of a launcher with future smart, two-way digital communications capability and the capability to launch current and future weapons from aviation aircraft ***FY 2020 Base Plans:*** Perform and implement functional architecture design and structure concept development in an effort to add additional weapon capability into the electrical and mechanical designs developed in Modernized Rocket Launcher Increment 1. Develop IML prototypes at the subsystem level and perform Safety testing to address release retention force methodology and the coupling to launch transient events to include firing tests. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Funds were realigned from Modernized Rocket Launcher Increment 1 and Smart Digital Interface efforts and merged into the IML effort. Activities associated with these efforts, to include design, fabrication and test of IML prototype hardware and software, increased.					
Title: FY2019 SBIR / STTR Transfer ***Description:*** FY2019 SBIR / STTR Transfer ***FY 2019 Plans:*** FY2019 SBIR / STTR Transfer ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease due to this being for FY2019 SBIR / STTR Transfer	-	2.128	-	-	-
Accomplishments/Planned Programs Subtotals	9.662	38.452	24.221	-	24.221

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
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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
• E37300: *Rocket, Hydra 70, All Types*	296.375	275.685	0.000	255.453	255.453	230.404	88.597	150.214	63.510	Continuing	Continuing

Remarks

D. Acquisition Strategy

The Acquisition Strategy is to utilize in-house expertise, Other Government Agencies, defense industry capabilities, and when appropriate utilize Other Transactional Agreement. The strategy allows the Government the ability to support urgent operational needs and unanticipated incidents, which require immediate and expert attention. This strategy will allow for the Government to maintain the Hydra-70 all-up-round rocket, its variants, Small Guided Munitions and posture for emerging requirements while leveraging new authorities and bringing along as many technologies as funding allows.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607142A / *Aviation Rocket System Product Improvement and Development*	Project (Number/Name) EW9 / *Aviation Rocket System Product Improvement and Dev*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
System Engineering/ Project Management	SS/ Various	Various : Performers	-	0.225	Jun 2018	2.625	Oct 2018	2.139	Oct 2019	-		2.139	Continuing	Continuing	-
		Subtotal	-	0.225		2.625		2.139		-		2.139	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Precision Kill Weapon System (APKWS)	MIPR	AMRDEC : Redstone Arsenal, AL	-	0.482	Jul 2018	0.608	Nov 2018	0.921	Nov 2019	-		0.921	0.000	2.011	-
Modernized Rocket Launcher Increment 1	MIPR	AMRDEC : Redstone Arsenal, AL	-	1.164	Aug 2018	10.445	Nov 2018	-		-		-	0.000	11.609	-
Smart Digital Interface	MIPR	AMRDEC : Redstone Arsenal, AL	-	7.791	Jun 2018	0.155	Jan 2019	-		-		-	0.000	7.946	-
Army aviation weapons	MIPR	Various : Various Performers	-	-		18.859	Nov 2018	1.904	Jan 2020	-		1.904	Continuing	Continuing	-
Integrated Munitions Launcher	MIPR	AMRDEC : Redstone Arsenal, AL	-	-		-		16.071	Dec 2020	-		16.071	Continuing	Continuing	-
FY2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		2.128	Oct 2019	-		-		-	0.000	2.128	-
		Subtotal	-	9.437		32.195		18.896		-		18.896	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Research Studies	MIPR	AMRDEC : Redstone Arsenal, AL	-	-		0.282	Dec 2018	-		-		-	Continuing	Continuing	-
		Subtotal	-	-		0.282		-		-		-	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607142A / *Aviation Rocket System Product Improvement and Development*	Project (Number/Name) EW9 / *Aviation Rocket System Product Improvement and Dev*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Testing	C/Various	TBD : TBD	-	-		3.350	Dec 2018	3.186	Dec 2019	-		3.186	Continuing	Continuing	-
		Subtotal	-	-		3.350		3.186		-		3.186	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	-	9.662		38.452		24.221		-		24.221	Continuing	Continuing	N/A

Remarks

The increase in FY19 funding and subsequent decrease in FY20 are due to ramp up and completion of activities associated with the validated ONS 16-21556 and Directed Requirement for Lightweight Precision Munitions.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607142A / *Aviation Rocket System Product Improvement and Development*	**Project (Number/Name)** EW9 / *Aviation Rocket System Product Improvement and Dev*

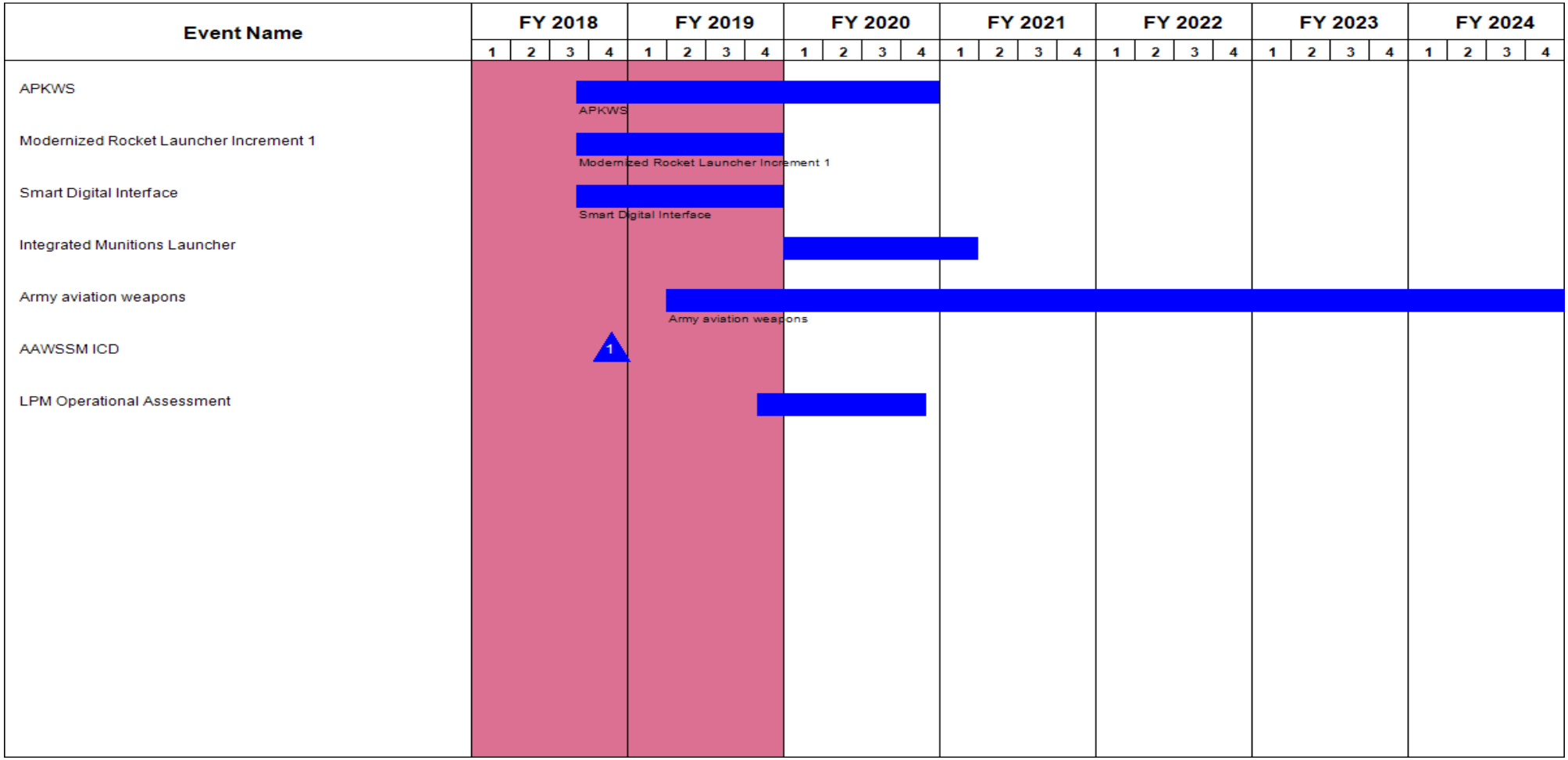

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607142A / *Aviation Rocket System Product Improvement and Development*	**Project (Number/Name)** EW9 / *Aviation Rocket System Product Improvement and Dev*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
APKWS	3	2018	4	2020
Modernized Rocket Launcher Increment 1	3	2018	4	2019
Smart Digital Interface	3	2018	4	2019
Integrated Munitions Launcher	1	2020	1	2021
Army aviation weapons	2	2019	4	2028
AAWSSM ICD	4	2018	4	2018
LPM Operational Assessment	4	2019	4	2020