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# SELF-PROPELLED HOWITZER PALADIN INTEGRATED MANAGEMENT (PIM)

**CLEARED**  
**For Open Publication**

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Department of Defense  
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**December 2021 Selected Acquisition Report (SAR)**



December 31, 2021  
Department of The Army

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## Executive Summary

**Program Highlights Since Last Report (Congress):** FY 2023 President's Budget (PB) funding is adequate to meet cost, schedule and performance objectives.

Full Rate Production was approved February 5, 2020. As of December 31, 2021, 178 weapon systems have been delivered, completing the fielding of 5 units and 1 Army Pre-positioned Stock (APS) set.

There are no significant software-related issues with this program at this time.

### History of Significant Developments Since Program Initiation:

Date	Description
Jun-2007	Start of the M109A7 Family of Vehicles (PIM) acquisition program.
Jun-2011	PIM designated ACAT ID.
Oct-2012	Completed Limited User Testing.
Oct-2013	Achieved Milestone C, LRIP contract awarded.
Sep-2015	Program delegated from OSD to Secretary of Army and designated ACAT IC.
Apr-2017	Army Acquisition Executive signed Acquisition Decision Memorandum (ADM) extending LRIP; authorizing 48 additional weapon systems.
Mar-2018	Completed Initial Operational Testing.
Sep-2018	Army Acquisition Executive signed ADM extending LRIP to procure up to 60 additional weapon systems.
Oct-2018	Achieved Initial Operational Capability.
Dec-2019	Army Acquisition Executive signed ADM extending LRIP; contract option exercised for 48 additional weapon systems.
Feb-2020	Army Acquisition Executive signed ADM approving FRP and procurement to the Army Acquisition Objective.

## Schedule

### Schedule Events

Event Title (or Header)	Current Objective	Current Threshold	Current Estimate/Actual Date	Deviation ?
Developmental Test Start	May-2011	May-2011	May-2011	
Milestone C	Oct-2013	Oct-2013	Oct-2013	
First Production Delivery	Mar-2015	Mar-2015	Mar-2015	
Operational Test Start	Oct-2016	Oct-2016	Oct-2016	

First Unit Equipped	Oct-2018	Oct-2018	Oct-2018	
IOC	Oct-2018	Oct-2018	Oct-2018	
Full Rate Production	Feb-2020	Feb-2020	Feb-2020	
FOC	Sep-2033	Mar-2034	Dec-2033	

<i>Schedule Notes:</i>	<i>Schedule Deviation Explanations:</i>
<p>Full Rate Production current estimate changed from January 2020 to February 2020 to align with FRP ADM approval dated February 5, 2020.</p> <p>The Full Operational Capability (FOC) current estimate changed from September 2033 to December 2033 to align with the end of M109A7 production run per February 21, 2019 TCM Brigade Combat Team (Fires) memorandum.</p>	

## Significant Schedule Risks

*(Provide current risks and risks identified at previous key decision points)*

Event	Date	Description
MS C	10/21/2013	Industrial base risk of meeting Engine Minimum Sustainment Rate.
FRP	2/5/2020	If production inefficiencies are not addressed, then future production costs may be higher.
FRP	2/5/2020	Demonstration of production rate capability, while maintaining quality, to support fielding schedule.
Current	12/31/2021	Electronic components continue to be the production pacing item due to supply chain challenges.

# Performance

Does Classified Data Exist for this Data Section?

Performance Attributes					
Current Objective	Current Threshold	Current Estimate	Deviation?	Demonstrated Performance	Date
Attribute Title:	KPP 1: Net-Ready: The capability, system and/or service must support Net-Centric military operations by providing sufficient Size, Weight, and Power (SWaP) capacity to integrate information and communication systems to ensure C2 and SA. The capability, system and/or service must be able to enter and be managed in the network and exchange data in a secure manner to enhance mission effectiveness. The capability, system and/or service must continuously provide survivable, interoperable, secure and operationally effective information exchanges to enable a Net-Centric military capability.			KPP	
The capability, system and/or service must provide sufficient SWaP capacity to integrate information and communication systems to ensure C2 and SA in order to fully support execution of all	The capability, system and/or service must provide sufficient SWaP capacity to integrate information and communication systems to ensure C2 and SA in order to fully support execution of joint critical operational	The program estimates that it will continue to achieve the Threshold requirement.		Threshold achieved.	

<p>operational activities and information exchanges identified in DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: 1) Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges; 2) Compliant with Net-Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications ; 3) Compliant with GIG Technical</p>	<p>activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content and must satisfy the technical requirements for transition to Net-Centric military operations to include: 1) Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges; 2) Compliant with Net-Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications; 3)</p>				
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<p>Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs, necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views; 4) IA requirements including availability, integrity, authentication, confidentiality and nonrepudiation, and issuance of an ATO by the DAA, and; 5) Supportability requirements to include SAASM, Spectrum and JTRS requirements.</p>	<p>Compliant with GIG Technical Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views; 4) IA requirements including availability, integrity, authentication, confidentiality and nonrepudiation, and issuance of an IATO or ATO by the DAA, and; 5) Supportability requirements to include SAASM, Spectrum and JTRS requirements.</p>				
<p>Attribute Title:</p>	<p><b>KPP 4: Digital Fire Control System (DFCS). Must be able to independently compute and execute precision fire missions.</b></p>			<p>KPP</p>	
<p>Must be able to independently compute and execute precision fire missions.</p>	<p>Receive, process, compute and transmit technical fire control data</p>	<p>The program estimates that it will continue to achieve the Threshold requirement.</p>		<p>Threshold achieved.</p>	

	from/to AFATDS to execute fire missions. Must be able to host current and future software upgrades.				
<b>Attribute Title:</b>	<b>KPP 5: Range</b>			<b>KPP</b>	
Minimum indirect fire range using the M107 projectile and MACS propellant shall be no more than 4 km (T=O). Maximum range when firing the M795 projectile and MACS propellant shall be no less than 40 km. Maximum range when firing assisted (i.e. rocket assisted) projectile M549A1 shall be no less than 50 km. Maximum range when firing the Excalibur M982 guided projectile shall be no less than 50 km. All range requirements are specified IAW ICAO standard conditions. Combined cannon, projectile, and propellant development efforts shall increase the	Minimum indirect fire range using the M107 projectile and MACS propellant shall be no more than 4 km (T=O). Maximum range when firing the M795 projectile and MACS propellant shall be no less than 22 km. Maximum range when firing assisted (i.e. rocket assisted) projectile M549A1 shall be no less than 30 km. Maximum range when firing the Excalibur M982 guided projectile shall be no less than 35 km. All range requirements are specified IAW ICAO standard conditions. Threshold requirements are based upon the	The program estimates that it will continue to achieve the Threshold requirement.		Threshold achieved.	



M109 maximum range to 70 km.	current production caliber tube.				
<b>Attribute Title:</b>	<b>KPP 6: Howitzer Reliability</b>			<b>KPP</b>	
84%	Will have reliability of 75% probability of completing an 18 hour combat mission	Based on the last completed test (IOT), the threshold was not achieved, with a DOT&E score of 65% per the DOT&E Initial Operational Test and Evaluation 2 Report, July 16, 2018. The M109A7 fell short of its reliability requirements due to M109A6 legacy components that were not part of the current increment of the M109A7 FOV Acquisition strategy. The program continues to improve reliability with the implementation of the breech reliability phase 2 upgraded components.		Threshold not achieved at IOT.	
<b>Attribute Title:</b>	<b>KPP 7: Howitzer Availability (Materiel Availability / Operational Availability)</b>			<b>KPP</b>	
Howitzer Am 83% and Ao 95%.	The Howitzer shall demonstrate Am of 81% (T), and an Ao of 78% (T).	The program estimates that availability will improve through implementation of breech reliability phase 2 upgraded		Based on the last completed test (IOT), the threshold was achieved for Ao, with a DOT&E score of Ao 92.6% per the DOT&E Initial Operational	

		components.		Test and Evaluation 2 Report, July 16, 2018. DOT&E did not report an Am score as 3 years of fielding data is preferred to provide an accurate Am score.	
<b>Attribute Title:</b>	<b>KPP 8: Carrier Ammunition Tracked Reliability</b>			<b>KPP</b>	
90%	Will have a reliability of 84% probability of completing an 18 hour combat mission.	The program estimates that it will continue to achieve the Threshold requirement.		Threshold achieved at IOT with a DOT&E score of 97% per the DOT&E Initial Operational Test and Evaluation 2 Report, July 16, 2018.	
<b>Attribute Title:</b>	<b>KPP 9: Carrier Ammunition Tracked Availability (Materiel Availability / Operational Availability)</b>			<b>KPP</b>	
CAT Am 72% and Ao 95%.	The CAT shall demonstrate a Am of 66% and an Ao of 85%.	The program estimates that it will continue to achieve the Threshold requirement.		Threshold achieved at IOT with a DOT&E score of Ao 95.6% per the DOT&E Initial Operational Test and Evaluation 2 Report, July 16, 2018. DOT&E did not report an Am score as 3 years of fielding data is preferred to provide an accurate Am score.	

<i>Performance Notes:</i>	<i>Performance Deviation Explanations:</i>

## Acquisition Budget Estimate

### Total Acquisition Cost

Budget Year: 2023 Base Year: 2013

Appropriation Category (\$Millions)	Objective Base Year (Current APB)	Threshold Base Year (Current APB)	Budget Estimate Base Year	Budget Estimate Then Year	Deviation?
RDT&E	\$ 1,075.1	\$ 1,182.6	\$ 1,075.4	\$ 1,085.6	
Procurement	\$ 7,500.6	\$ 8,250.7	\$ 7,756.2	\$ 9,803.2	
MILCON					
Acq O&M	\$ 30.9	\$ 34.0	\$ 5.8	\$ 6.7	
Total Acquisition	\$ 8,606.6		\$ 8,837.4	\$ 10,888.8	
PAUC	\$ 12.455		\$ 12.784	\$ 15.758	
APUC	\$ 10.886		\$ 11.257	\$ 14.228	

### Total End Item Quantity

Quantity	Current APB	Current Estimate
Development Qty	2	2
Procurement Qty	689	689

#### Budget Notes:

APUC and PAUC have remained stable since the 2020 SAR at ~11.3 BY13\$M and ~12.8 BY13\$M, respectively. From the 2019 SAR to the 2020 SAR, APUC increased ~4% due to the procurement buy profile stretching out to align with the FY 2022 PB.

#### Quantity Notes:

#### Cost Deviation Explanations:

## Risk and Sensitivity Analysis

### Current Procurement Risks:

The M109A7 FoV current estimate, based on 689 weapon systems, reflects various time-phasing and budget adjustments; PAUC and APUC remain within 6% of the Original UCR Baseline.

## Unit Cost

### Current Baseline Compared with Current Estimate

Current Baseline Base Year: 2013

Category (\$ Millions)	Current Baseline	Current Estimate	% Change	Breach? Significant or Critical
<b>Program Acquisition Unit Cost</b>				
Acquisition Cost	\$8,606.6	\$ 8,833.5		
Program Quantity	691	691		
PAUC	\$ 12.455	\$ 12.784	2.64%	None
<b>Average Procurement Unit Cost</b>				
Procurement Cost	\$ 7,500.60	\$ 7,756.2		
Procurement Quantity	689	689		
APUC	\$ 10.886	\$ 11.257	3.41%	None

### Original Baseline Compared with Current Estimate

Original Baseline Base Year: 2011

Category (\$ Millions)	Original Baseline	Current Estimate	% Change	Breach? Significant or Critical
<b>Program Acquisition Unit Cost</b>				
Acquisition Cost	\$ 6,641.0	\$ 8,552.8		
Program Quantity	582	691		
PAUC	\$ 11.411	\$ 12.377	8.47%	None
<b>Average Procurement Unit Cost</b>				
Procurement Cost	\$ 5,640.0	\$ 7,506.4		
Procurement Quantity	580	689		
APUC	\$ 9.724	\$ 10.895	12.04%	None
Impacts of Schedule Changes on Unit Cost:				

Unit Cost Notes:
Army Acquisition Executive approved Current APB, September 24, 2021 aligns with BES23 submission.

## Contracts

Activity Title:					
Supported Phase		CAGE Code		City	
Work Start Date		CAGE Legal Name		State/Province	
Notes					

## Contracts and Efforts

<b>Contract Number:</b>	W56HZV-17-C-0001	<b>Order Number:</b>		<b>Contract Title:</b>	FY17-FY20 M109A7 M992A3 Production		
CAGE Code		City	York	Contracting Office			
CAGE Legal Name		State/Province	PA	Contract Strategy			
<b>Effort Number</b>							
Supportive Phase	Production	Latest Modification Number		Definitization Date	12/21/2017		
Contract Type	Fixed-Price Incentive (Firm Target)	Latest Modification Date		Work Start Date	4/3/2017		
Technical Data Rights	None	Notes					
<b>Contract/Effort Price, Quantity and Performance (\$M)</b>							
Initial Target Price	\$ 557.30	Current Target Price	\$ 1,572.80	Contractor's EAC	\$ 1,443.40		
Initial Ceiling Price	\$ 585.40	Current Ceiling Price	\$ 1,488.90	PM's EAC	\$ 1,438.40		
Initial Quantity	96	BAC	\$ 1,360.30	BCWP	\$ 774.20	Work Completed	56.91%
Current Quantity	408	ACWP	\$ 792.70	BCWS	\$ 853.60	Cost Variance	-\$ 18.50
Delivered Quantity	216					Schedule Variance	-\$ 79.40
Factors Contributing to Cost Variance and Projected Effects on Program Costs:				Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:			

<p>Cost and Schedule Variance reporting is not required on this (FPIF) contract.</p> <p>The difference between the Initial Contract Price Target and the Current Contract Price Target is due to Award of FY 2019 Production December 2019 (planned 48 weapon systems) and FY 2020 Production March 2020 (planned 48 weapon systems).</p> <p>The Target Price includes data for all exercised FPIF and Cost Plus Fixed Fee Contract Line Items (CLIN), however, the contract Ceiling Price represents only FPIF CLINs.</p> <p>Contract quantities are tracked by vehicle rather than weapon systems.</p>	
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## Technologies and Systems Engineering

### Significant Technical Risks

Event	Date	Description

### Deliveries and Expenditures

Quantities	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	2	2	2	100.00%
Procurement	176	176	689	25.54%
<b>Total</b>	178	178	691	25.76%

Please note **Percent Delivered** is for display purposes only. It uses Current Estimate Quantities from this form. Current Estimate Quantities (pulled from DAVE—not this form) and values from this table will be used to calculate this percentage in Advana

Years Appropriated to date	15	Total Years Appropriated Funding (Current Baseline):	27	Percent Years Appropriated:	55.56%
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Appropriation Category (\$Millions)	Then Year Appropriated Amount	Then Year Expended Amount
RDT&E		1,085.60
Procurement		2,232.10
MILCON		0.00

Acq O&M		6.78
<b>Total Appropriated/Expended</b>		3,324.48
<b>Percent Appropriated/Expended</b>	0.00%	30.75%

Delivery and Expenditure Notes:

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## Low-Rate Initial Production

	Initial Decision LRIP	Current Total LRIP
Approval Date	10/21/2013	12/12/2019
Approval LRIP Quantity	67	223
Approval Document Title	Milestone C ADM	Extended LRIP ADM
Start Year	2014	2014
End Year	2017	2020

Rationale if quantity exceeds 10% of the total number of articles to be produced: CUI: \_\_\_\_\_

The Current Total LRIP Quantity is more than 10% of the total production quantity as authorized in the Milestone C ADM to provide adequate test assets to complete all required tests and to provide a gradual ramp-up to FRP.

Quantity Note:

CUI: \_\_\_\_\_

The Current Total LRIP Approved Quantity buy of 223 PIM systems includes two RDT&E-funded LRIP systems procured in FY 2014 for Full Up System Live Fire Testing and 221 Procurement-funded PIM systems.

## Operating and Support (O&S) Cost

### Total Program O&S Costs Compared with Baseline

	Current Base Year Objective	Current Base Year Threshold	Current Base Year Estimate	Current Then Year Estimate	Deviation?
<b>Total O&amp;S (\$Millions)</b>	\$ 19,006.00	\$ 20,906.60	\$ 16,018.64	\$ 28,691.92	

Deviation Explanation:

### Operating and Support Cost Breakdown

Category (Base Year \$Millions)	System Name: PIM	System Name:
Unit-Level Manpower	\$ 8,889.57	\$ 9,235.37

Unit Operations	\$ 1,472.86	\$ 1,924.24
Maintenance	\$ 2,435.31	\$ 1,422.14
Sustaining Support	\$ 2,163.74	\$ 1,569.11
Continued System Improvements	\$ 1,044.06	\$ 810.70
Other	\$ 13.10	\$ 7.45
<b>Total O&amp;S</b>	<b>\$ 16,018.64</b>	<b>\$ 14,969.01</b>

## Cost Estimate Source

**Type:** Program Office Estimate

**Approval Authority and Date:** March 24, 2022

**Note:**

### O&S Notes:

Cost Risks: A Component Cost Estimate (CCE) was prepared January 15, 2020. The cost risk associated with this program is considered moderate for the following reasons. Reference costs from Cost and Software Data Reports (CSDR) were used to develop the estimate from 2021 to 2031 for production. These production costs have no learning and a small rate improvement curve applied to materials. Future annual production rates are projected to be between 30 and 48 weapon systems per year and suggest the January 15, 2020 CCE may be overestimating production costs. However, the first two production lots had welding issues which caused significant rework. The contractor is working to correct the welding process but there is no guarantee the welding mitigation solution will resolve all of the contractor's issues. Additionally, there are other programs competing for production assets which could cause capacity issues. The rework costs were not reported in the CSDRs used in this estimate.

A Program Office Estimate (POE) was prepared March 24, 2022. The cost risks associated with the POE are generally similar to those of the CCE. However, since the CCE, the prime contractor has stabilized production rates and is delivering weapon systems on schedule.