
ARMORED MULTI-PURPOSE VEHICLE (AMPV)

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): The AMPV program requirements are stable, and funding is adequate to meet cost, schedule and performance objectives. To date, AMPV has executed within its threshold APB cost, schedule and performance parameters. The program mitigated the schedule risk identified in last year's SAR by meeting the three criteria identified to close the risk (weld rework, second source cable supplier and delivery of all Initial Operational Test and Evaluation (IOT&E) vehicles).

As of December 2021, BAE has delivered 80 Low Rate Initial Production (LRIP) vehicles including all vehicles required to start IOT&E on time in January 2022. The LRIP delivery schedule was contractually modified in November 2021 to align with the AMPV program schedule. To date, BAE has delivered to the revised schedule and the PM is closely watching BAE's vehicle production progress towards delivering future vehicles at the contractual rate of 11 vehicles/month by March 2022.

The PM successfully completed the remaining development testing for the EMD phase and contractor risk mitigation testing, which verified performance specification compliance for design fixes to be cut into production. Production Qualification Testing (PQT) and Live Fire Testing (LFT) continued in 2021. Twenty (20) PQT vehicles are currently in test. Seven (7) of the PQT vehicles completed 14,500 Reliability and Maintainability (RAM) miles. For LFT, 21 of 35 planned events have been successfully conducted at Aberdeen Test Center.

In July 2021, the PM awarded the AMPV/M113 System Technical Support (STS), Sustainment System Technical Support (SSTS) and Post Production Technical Support contract to BAE. This effort will provide the needed technical support during LRIP, Full Rate Production (FRP) and sustainment execution.

For overall program system performance, the PM is projecting to meet all APB Key Performance Parameters (KPP) threshold requirements. There was no change to the Army Acquisition Objective (AAO) or performance requirements since the last report, demonstrating that the AMPV program requirements are stable. Verification is ongoing with testing.

To date, there are no marks against the FY 2022 RDT&E funding line. This is the last year of RDT&E in the funding line. There are two marks on the Weapons & Tracked Combat Vehicles (WTCV) funding the line. The HAC-D reduced \$42.727M to "Maintain FY 2021 level of effort," and the SAC-D reduced \$14.6M due to "Change orders early to need." The HAC-D reduction, if implemented, will result in the PM being unable to fund planned second LRIP brigade of Improved Commander's Weapon Station (iCWS), hybrid armor skirts for LRIP vehicles, planned software updates, and some total package fielding; training aids, devices, simulators and simulations (TADSS) equipment; and System Technical Services (STS) requirements.

The FY 2023 PB is adequate to meet cost, schedule and performance objectives.

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

History of Significant Developments Since Program Initiation:

Date	Description
Jun-2013	AMPV CDD approved.
Dec-2014	AMPV Milestone B Defense Acquisition Board (DAB).
Dec-2014	The Defense Acquisition Executive (DAE) Acquisition Decision Memorandum (ADM) authorizes AMPV to enter the acquisition lifecycle at Milestone B. The ADM directs the Army to fund the AMPV program to the OSD Cost Assessment and Program Evaluation (CAPE) Independent Cost Estimate (ICE).
Dec-2014	BAE Systems Land & Armaments is awarded a Cost Plus Incentive Fee EMD contract.
Mar-2015	The System Requirements Review (SRR) was completed. The SRR deemed the program ready to proceed into preliminary design.
May-2015	Development APB approved.
Jun-2015	Completed the Preliminary Design Review ensuring the allocated baseline was properly documented, assessed to be consistent with Capability Development Document (CDD) requirements and under configuration control.
Jun-2016	Completed Critical Design Review demonstrating that the program was ready to proceed to prototype production. Performance risks were understood and will be characterized with prototype testing.
Oct-2016	CDD revised to incorporate changes to KPP 2 – Survivability.
Dec-2016	Roll-out ceremony for first AMPV prototype.
Jan-2017	First AMPV Prototype delivered.
Jul-2017	Developmental Test started.
Sep-2017	AMPV Milestone B ADM was amended to increase LRIP quantities from 289 to 551 vehicles.
Mar-2018	Final EMD Prototype delivered.
Aug-2018	Functional Configuration Audit and System Verification Review completed.
Sep-2018	Limited User Test completed.
Oct-2018	Production Readiness Review completed.
Dec-2018	AMPV Milestone C Army Systems Acquisition Review Council approved entrance into LRIP.
Jan-2019	AMPV CPD approved.
Jan-2019	Army Acquisition Executive signed the Milestone C ADM authorizing AMPV to enter LRIP. The ADM directs the Army to fund the AMPV program to the OSD CAPE ICE.
Jan-2019	LRIP Option Year 1 and the first increment of LRIP Option Year 2 exercised to BAE Systems Land & Armaments to begin LRIP production.
Jan-2020	LRIP Option Year 3 exercised to BAE Systems.
Aug-2020	First LRIP vehicle delivered.
Jan-2021	AMPV APB re-baseline approved.
Feb-2021	LRIP Live Fire Test & Evaluation started.
Jul-2021	AMPV System Technical Support (STS) contract awarded.

Schedule

Schedule Events

Event Title (or Header)	Current Objective	Current Threshold	Current Estimate/ Actual Date	Deviation?
Milestone B	Dec-2014	Dec-2014	Dec-2014	
Preliminary Design Review	Jun-2015	Jun-2015	Jun-2015	
Critical Design Review	Jun-2016	Jun-2016	Jun-2016	
Development Test Start	Jul-2017	Jul-2017	Jul-2017	
Limited User Test	Aug-2018	Aug-2018	Aug-2018	
Milestone C	Jan-2019	Jan-2019	Jan-2019	
LRIP Live Fire Test & Evaluation	Feb-2021	Feb-2021	Feb-2021	
IOT&E Start	Jan-2022	Jul-2022	Jan-2022	
Full Rate Production	Oct2022	Apr-2023	Oct-2022	
First Unit Equipped	Feb-2023	Aug-2023	Jan-2023	
Initial Operational Capability	Apr-2023	Oct-2023	Feb-2023	
Full Operational Capability	Dec-2042	Jun-2043	Dec-2042	

<i>Schedule Notes:</i>	<i>Schedule Deviation Explanations:</i>
AMPV does not have any current schedule risks and no schedule risks were identified at previous key events.	

Significant Schedule Risks

Even	Date	Description

Performance

Classified data exists for this Data Section.

Performance Attributes					
Current Objective	Current Threshold	Current Estimate	Deviation?	Demonstrated Performance	Date
Attribute Title:		KPP 5 Energy		KPP	
30 Miles per Hour (MPH) on primary roads. The AMPV must be able to use alternative energy and/or fuels (future fuel types) and will complete an entire 72-hour mission cycle in accordance with (IAW) AMPV OMS/MP without allocated refuels.	The AMPV, at full combat configuration, will consume fuel at a level necessary to complete 225 miles without refueling, when evaluated at sustained speeds of 25 MPH on primary roads.	AMPV Management estimates that the program will achieve the Threshold requirement.		249.2 miles without refueling at an average sustained speed of 29.6 MPH	7/19/2021
Attribute Title:		KPP 6 Mobility		KPP	
The AMPV will be capable of traversing the terrains, objects, and obstacles typical in primary roads, crosscountry and urban terrain required to maintain mobility thresholds as outlined in the AMPV OMS/MP and successfully fulfill its role in the Brigade Combat Team (BCT) by maintaining its doctrinal positioning within the formation.	(T=O) The AMPV will be capable of traversing the terrains, objects, and obstacles typical in primary roads, cross country and urban terrain required to maintain mobility thresholds as outlined in the AMPV OMS/MP and successfully fulfill its role in the BCT by maintaining its doctrinal positioning within the formation.	AMPV Management estimates that the program will achieve the Threshold requirement.		1) Hard level surface road speed = MET - Achieved a speed range of 39.4mph to 41.2mph (across the 5 variants 2) Ascend and Descend 60% grades = MET 3) Laterally traversing 30% grade = MET 4) Dash speed = MET - Achieved a time range of 20.3 seconds to 23.6 seconds to reach 30mph (across the 5 variants) 5) Traverse 24-inch obstacle forward = MET 6) Traverse an 18	8/24/2021

				inch obstacle in reverse = MET	
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Performance Notes:	Performance Deviation Explanations:
<p>Detailed KPP information is available in the AMPV CPD, including Table 5.1 referenced in the Performance Characteristics above.</p> <p>KPPs are operational requirements that are expected to be assessed during Initial Operational Test & Evaluation, currently slated to start in January 2022. The PM conducted several performance tests on the AMPV technical requirements (Performance Specification (PSPEC)) during EMD. This KPP assessment is based on verification of PSPECs to date that trace to the KPPs. These requirements will be retested on LRIP vehicles. To date, some PSPECs are still pending verification in LRIP (not tested in EMD).</p>	

Acquisition Budget Estimate

Total Acquisition Cost

Budget Year: 2023 Base Year: 2019

Appropriation Category (\$Millions)	Objective Base Year (Current APB)	Threshold Base Year (Current APB)	Budget Estimate Base Year	Budget Estimate Then Year	Deviation?
RDT&E	\$1,031.0	\$1,134.1	\$1,031.4	\$1,029.1	
Procurement	\$11,579.6	\$12,737.6	\$11,572.7	\$15,586.8	
MILCON	\$0.0	\$0.0	\$0.0	\$0.0	
Acq O&M	\$151.3	\$166.4	\$155.0	\$204.9	
Total Acquisition	\$12,761.9		\$12,759.1	\$16,820.8	
PAUC	\$4.347	\$4.782	\$4.346	\$5.729	
APUC	\$3.997	\$4.397	\$3.995	\$5.380	

Total End Item Quantity

Quantity	Current APB	Current Estimate
Development Qty	39	39
Procurement Qty	2,897	2,897

Budget Notes:

Overall the Program Office Estimate cost has increased. This occurred as the estimate was aligned to the FY23 Budget position that decreased the number of AMPVs to be purchased in the FY 2025-2027 timeframe vs the previous FY 2022 PB.

Estimating - Revised estimate to align with the FY 2023 PB.

Schedule - Schedule variance due to shifting quantities in FY 2023 thru FY 2027 and FY 2040 thru FY 2041, to align with the FY 2023 PB. The total AMPV AAO quantity of 2,897 remains the same.

Quantity Notes:

To support the development phase, 39 AMPVs are required: 29 AMPV prototype vehicles for EMD and ten production representative AMPVs for Full-Up System Level live fire tests; the live fire test assets are RDT&E-funded in LRIP.

Risk and Sensitivity Analysis

Current Procurement Risks:

The Current Procurement Cost risk and sensitivity is the same as the Current Baseline Estimate. Please refer to the Current Baseline Estimate for additional information.

Unit Cost

Current Baseline Compared with Current Estimate

Current Baseline Base Year: 2019

Category (\$ Millions)	Current Baseline	Current Estimate	% Change	Breach? Significant or Critical
Program Acquisition Unit Cost				
Acquisition Cost	\$12,761.9	\$12,759.1		
Program Quantity	2,936	2,936		
PAUC	\$4.347	\$4.346	-0.02%	None
Average Procurement Unit Cost				
Procurement Cost	\$11,579.6	\$11,572.7		
Procurement Quantity	2,897	2,897		
APUC	\$3.997	\$3.995	-0.06%	None

Original Baseline Compared with Current Estimate

Original Baseline Base Year: 2015

Category (\$ Millions)	Original Baseline	Current Estimate	% Change	Breach? Significant or Critical
Program Acquisition Unit Cost				
Acquisition Cost	\$10,724.8	\$12,141.5		
Program Quantity	2,936	2,936		
PAUC	\$3.653	\$4.135	13.21%	None
Average Procurement Unit Cost				
Procurement Cost	\$9,736.6	\$11,012.5		
Procurement Quantity	2,897	2,897		
APUC	\$3.361	\$3.801	13.11%	None
Impacts of Schedule Changes on Unit Cost:				
The schedule had a minimal impact on the overall Unit cost for the AMPV program.				
Unit Cost Notes:				

Contracts

Activity Title:	AMPV EMD/LRIP				
Supported Phase	Development	CAGE Code	7B726	City	Sterling Heights
Work Start Date	12/23/2014	CAGE Legal Name	BAE Systems Land & Armaments, L.P.	State/Province	MI
Notes	The execution of this activity supports both development and production phases.				

Activity Title:	AMPV/M113 System Technical Support (STS), Sustainment System Technical Support (SSTS), and Post Production Sustainment Support (PPSS)				
Supported Phase	Production	CAGE Code	7B726	City	Sterling Heights
Work Start Date		CAGE Legal Name	BAE Systems Land & Armaments, L.P.	State/Province	MI
Notes	The execution of this activity supports both production and sustainment phases.				

Contracts and Efforts

Contract Number:	W56HZV-15-C-A001	Order Number:		Contract Title:	AMPV LRIP Options	
CAGE Code	7B726	City	Sterling Heights	Contracting Office	ACC-DTA; DCMA Detroit	
CAGE Legal Name	BAE Systems Land & Armaments, L.P.	State/Province	MI	Contract Strategy	FAR 15: Negotiated Contracts	
Effort Number						
Supportive Phase	Development	Latest Modification Number	P00125	Definitization Date	12/23/2014	
Contract Type		Latest Modification Date	12/10/2021	Work Start Date	1/25/2019	
Technical Data Rights	P00125	Notes	No singular Technical Data Rights category applies.			
Contract/Effort Price, Quantity and Performance (\$M)						
Initial Target Price	\$1,277.00	Current Target Price	\$1,337.50	Contractor's EAC	\$ 1,600.83	
Initial Ceiling Price		Current Ceiling Price		PM's EAC	\$1,600.00	
Initial Quantity	297	BAC	\$1,582.9	BCWP	\$394.3	Work Completed 24.91%

Current Quantity	467	ACWP	\$399.4	BCWS	\$439.4	Cost Variance	-\$5.10
Delivered Quantity	80					Schedule Variance	-\$45.10
Factors Contributing to Cost Variance and Projected Effects on Program Costs:				Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:			
The unfavorable cost variance is due to vehicles costing more than planned due to rework and expending more effort to recoup schedule. While the cost overrun is not ideal the program's obligation is limited to the contract ceiling of \$1,393.5M which is within the program budget.				The unfavorable schedule variance is due to BAE's inability to produce vehicles on time. The contract was modified in November 2021 in order to align the deliveries with the overall program schedule. BAE is executing to the new contractual delivery schedule, the schedule variance in the data is based on the old delivery schedule.			

Technologies and Systems Engineering

Significant Technical Risks

Event	Date	Description
MS B	10/31/2014	Risk: If there are insufficient electrical growth margins for Size, Weight and Power-Cooling (SWaP-C), then the AMPV will be unable to accommodate future power demand of Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) equipment and mobility growth. Risk is mitigated by PM engineers performing a high-level power study prior to source selection to ensure that an appropriate solution which meets the 20% growth requirement is available. PM estimated a minimum power growth of 15% is required.
MS B	10/31/2014	Risk: If adequate powertrain cooling is not provided, then the vehicle will experience automotive performance degradation. Risk is mitigated by using modeling and simulation to evaluate the proposed solutions during source selection. At each phase in the design process the powertrain cooling model will be refined based on test data from components, subsystem and system level evaluation. Simulation will be used to reduce the test-fix-test cycle to ensure adequate cooling performance within the SWaP-C envelope.
MS B	10/31/2014	Risk: If a contractor is selected for the AMPV that did not previously integrate the M121 Mortar system on their Military Vehicle Derivative additional integration risks may occur. Risk is mitigated by evaluating design maturity during source selection. The contractor will conduct early structural analysis to inform prototype development. Mortar Carrier

		firing will be conducted during early testing to validate firing tables and structural analysis.
MS B	10/31/2014	Risk: The Handheld, Manpack and Small Form Fit (HMS) Acquisition Strategy increases competition but may cause additional delays in deliveries for AMPV EMD which increases the likelihood of this risk. Risk mitigated through PM AMPV creating a "Revert to Single Channel Ground and Airborne Radio System (SINCGARS) Strategy" that will change the vehicle design to accept the SINCGARS in place of the new HMS Radio. Any future Engineering Change Proposals to modify the vehicle to accept HMS Radios would be fully funded by PM HMS.

Deliveries and Expenditures

Quantities	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	39	39	39	100.00%
Procurement	70	70	2897	2.42%
Total	109	109	2,936	3.71%

Years Appropriated to date	11	Total Years Appropriated Funding (Current Baseline):	32	Percent Years Appropriated:	34.38%
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Appropriation Category (\$Millions)	Then Year Appropriated Amount	Then Year Expended Amount
RDT&E	993.56	898.59
Procurement	1,494.54	319.31
MILCON	0.00	0.00
Acq O&M	17.80	17.80
Total Appropriated/Expended	\$2,505.90	\$1,235.70
Percent Appropriated/Expended	14.90 %	7.35%

Delivery and Expenditure Notes:

The above data is current as of December 31, 2021

Low-Rate Initial Production

	Initial Decision LRIP	Current Total LRIP
Approval Date	12/23/2014	9/26/2017
Approval LRIP Quantity	289	551
Approval Document Title	Milestone B ADM	Milestone B ADM Amendment
Start Year	2018	2018
End Year	2022	2022

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 due to an amendment to the AMPV Milestone B ADM on September 26, 2017. This amendment increased the LRIP quantity from 289 to 551 vehicles. The increased AMPV LRIP quantity is in support of the European Deterrence Initiative and in response to an U.S. Army Europe (USAREUR) Operational Needs Statement (ONS). In response to the ONS, the Army approved a Directed Requirement for AMPV to replace the M113 family of vehicles in the Armored Brigade Combat Teams aligned with USAREUR. The Directed Requirement requires initial fielding of AMPV by the end of CY 2019, with a maximum of 262 combat platforms acquired and integrated into the European Activity Set and Army Prepositioned Stock-2.

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 ?
Total O&S (\$Millions)	\$29,917.3	\$32,909.0	\$29,917.3	\$49,819.7	

Operating and Support Cost Breakdown

Category (Base Year \$Millions)	System Name: AMPV	System Name: M113 (Antecedent)
Unit-Level Manpower	\$ 14,553.3	\$ 12,450.1
Unit Operations	\$ 2,756.6	\$ 3,133.2
Maintenance	\$ 5,562.0	\$ 4,014.9

Sustaining Support	\$ 1,241.0	\$ 1,509.9
Continued System Improvements	\$ 2,307.5	\$ 374.2
Other	\$ 3,496.9	\$ 4,998.8
Total O&S	\$ 29,917.3	\$ 26,481.1

Cost Estimate Source

Type: Independent Cost Estimate

Approval Authority and Date: Army Acquisition Executive; 12/19/2018

Note: Program was baselined to the OSD CAPE ICE approved at the MS C decision for AMPV.

O&S Notes:

OSD CAPE removed the O&S category "Indirect Support" from the SAR so this line item is now being accounted for under "Other".

Total Cost numbers were set to match the new Milestone C APB Objective values.

Total Cost= #of systems x service life per system x average annual cost

\$29,917,290.117 = 2897 x 26 x \$397.192 (BY 2019 \$K)

	AMPV	M113 (Antecedent)
1.0 Unit Manpower Total	\$193.215	\$165.292
2.0 Unit Operations Total	\$36.598	\$41.597
3.0 Maintenance Total	\$73.844	\$53.303
4.0 Sustaining Support Total	\$16.476	\$20.046
5.0 Continuing System Improvements	\$30.636	\$4.968
6.0 Indirect Support	N/A	N/A
Other	\$46.424	\$66.366
Total O&S cost per vehicle per year BY2019\$K	\$397.192	\$351.572