

Armored Multi-Purpose Vehicle (AMPV)

Executive Summary

- Upon completion of a Limited User Test (LUT) in September 2018, the Army approved Milestone C and the Armored Multi-Purpose Vehicle (AMPV) program entered into low-rate initial production (LRIP).
- The Program Office identified several engineering and design fixes to address the deficiencies identified during the LUT.
- Production delays and quality challenges from the BAE plant in York, Pennsylvania, affect the test schedule and may cause a delay of the IOT&E scheduled for 3QFY21.
- In FY19, the Army completed Phase I system-level live fire testing of the AMPV General Purpose (GP) and Mortar Carrier (MC) variants to assess survivability and force protection specification requirements. Live fire testing will continue through 3QFY21 for all AMPV variants.



Mission Command (Mcmd)



Mortar Carrier (MC)



General Purpose (GP)



Medical Evacuation (ME)



Medical Treatment (MT)

System

- The AMPV will replace the M113 Family of Vehicles program that the Army terminated in 2007. The AMPV is required to operate alongside the M1 Abrams Main Battle Tank and the M2 Bradley Infantry Fighting Vehicle in the Armored Brigade Combat Team (ABCT).
- The Army intends for the AMPV variants to address the M113 shortcomings in survivability and force protection; size, weight, power, and cooling; and the ability to incorporate future technologies, such as the Army Network.
- The Army is reusing the Mission Equipment Packages from the existing M113 FoV in the AMPV variants.

- The AMPV has five variants:
 - GP vehicle from which the unit First Sergeant conducts combat resupply escort, emergency resupply, and casualty evacuation; and provides security for medical evacuation.
 - Mission Command vehicle to integrate the communications equipment in accordance with the Network Systems Architecture.
 - Medical Treatment (MT) vehicle to provide an armored and mobile protected environment for the unit surgeon and medical staff to provide immediate medical care of casualties or life stabilization triage for casualties prior to their evacuation to more capable facilities.
 - Medical Evacuation (ME) (Ambulance) vehicle supports the ABCT integration of medical support providing protected ambulance evacuation and immediate medical care to the mechanized and armored cavalry units.

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- MC vehicle provides immediate, responsive, heavy mortar fire support to the ABCT in the conduct of fast-paced offensive operations by utilizing the M121 Mortar System and the M95 Mortar Fire Control System.

Mission

Commanders employ units equipped with the AMPV to provide a more survivable and highly mobile platform to accomplish

required operational support missions across the range of military operations. ABCT units use AMPVs to conduct logistical resupply; casualty evacuation and treatment; command post operations; and heavy mortar fire support.

Major Contractor

BAE Systems – York, Pennsylvania

Activity

- DOT&E provided emerging results of AMPV LUT performance to the program manager in October 2018.
- The program manager requested permission to enter into LRIP at Milestone C from the Assistant Secretary of the Army for Acquisition, Logistics and Technology in October 2018.
- DOT&E approved the Milestone C Test and Evaluation Master Plan in December 2018.
- The program entered into LRIP in January 2019, with the first LRIP vehicle expected delivery in March 2020.
- DOT&E published the final Operational Assessment and Live Fire survivability evaluation of the AMPV in June 2019.
- The Program Office expects the BAE delivery of first LRIP vehicles to be delayed by 2 months and the completion of production qualification testing (PQT) to be delayed by 7 months due to BAE-York tooling and the assembly line challenges.
- In September 2019, the Program Office presented an updated engineering plan to address the major deficiencies identified by both the DOT&E and Army Test and Evaluation Command (ATEC) reports. Fourteen of the deficiencies are to be addressed during the redesign of the vehicle and corrected prior to the first vehicle completing LRIP. Seven of the deficiencies are to be corrected after LRIP has begun, but corrected prior to the start of the IOT&E in 3QFY21.
- The Program Office and BAE have begun instituting the following design and engineering changes to address the deficiencies observed by DOT&E and ATEC.
 - BAE is updating assembly and manufacturing instructions for shimming and sealing all hatches to correct leaking at all of the hatch seals.
 - BAE is installing a low battery Warning Caution Alert and updated harness design to remove stresses on connectors, and updated voltage regulator to prevent voltage regulator failures. This is intended to address the frequent rebooting of the electronics and frequent blacking out of the screens.
 - The U.S. Army Armament Research, Development and Engineering Center is developing a Commander's Weapon Station with larger hatch space and improved positioning of ballistic glass to improve both the ability to reload mounted weapons and the vision and situational awareness around the vehicle.
 - The Program Office is considering the installation of a 25-foot cable with a monitor to allow a unit to project the Joint Battle Command Platform display into the Tactical Operations Center from the interior of the vehicle.
- The Program Office is developing a map board and installation kit to facilitate analog operations.
- BAE redesigned the ambulatory patient seats to improve ambulatory to litter configuration for easier and faster operation.
- BAE moved the antenna bracket on the MC 6 inches to reduce probability of antenna damage due to blast overpressure during mortar firing.
- BAE has updated the ramp cable design to incorporate a cable tray to route the wiring harnesses away from stowed ammunition in order to eliminate interference of the ramp cable with the stowed mortar ammunition.
- BAE welded a new base to the bipod to prevent the latch from disengaging during firing. ATEC conducted a successful prove out test and an additional durability test to verify the design.
- The June 2019 report included results from live fire testing performed during the Engineering and Manufacturing Development phase (e.g., armor coupon testing, ballistic hull testing, and some Phase I system-level testing).
- The Army continues to conduct live fire testing in accordance with DOT&E-approved test plans.
- The Army completed Phase I system-level live fire tests in September 2019 on prototype GP and MC variants to evaluate system and crew vulnerability to direct-fire kinetic energy munitions, shape-charged jet threats, artillery, explosively formed penetrators, and side and underbody mines.
- Phase II system-level live fire tests will begin in 4QFY19 and end in 3QFY20. The Phase II live fire test series includes eight underbody events distributed across all AMPV variants with the exception of the MC variant that was tested during Phase I.
- AMPV full-up system-level (FUSL) testing is on schedule to start in FY20. Informed by Phase I and Phase II live fire test data, the Army efficiently designed the FUSL test series to support a system survivability and crew casualty assessment of the production-representative AMPV variants against expected operational threats.

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Assessment

- Delay in delivery of vehicles will have a significant effect on the remaining test schedule. The program manager assesses the IOT&E may be delayed by 4 months.
- During the LUT, full understanding of the cybersecurity vulnerabilities could not be assessed because of the lack of an outsider threat environment.
- The corrective actions taken to address deficiencies in the vehicle will be assessed during PQT and the IOT&E.
- The LFT&E program conducted during the Engineering and Manufacturing Development phase identified minor vehicle design vulnerabilities that the Program Office is addressing with the vendor to meet survivability and force protection requirements.
- Preliminary analysis of armor coupon testing demonstrated expected armor protection capabilities.

- DOT&E will provide a comprehensive classified AMPV survivability LFT&E report to support the Full-Rate Production decision in FY22.

Recommendations

The Army should:

1. Verify the corrective measures derived from the deficiencies identified during the LUT during PQT and IOT&E.
2. Continue to correct and validate design changes intended to mitigate vehicle and crew vulnerabilities found in live fire testing.
3. Conduct the IOT&E in an operational environment where full cybersecurity testing can be exploited.

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