

## Advanced Amphibious Assault Vehicle (AAAV)

The Advanced Amphibious Assault Vehicle (AAAV) is an amphibious armored personnel carrier that will replace the current Marine Corps assault amphibian, the Amphibious Assault Vehicle (AAV). Two variants are under development. The personnel variant (AAAV(P)) will be armed with a 30-mm cannon and a 7.62-mm machinegun and is intended to transport 17 combat-equipped Marines and a three-man crew. The command and control variant (AAAV(C)) will transport a commander and staff. An operationally configured AAAV will weigh about 38 tons and travel in excess of 20 knots in 3-foot significant wave height sea conditions, and at 43 miles per hour on a level, hard-surface road.

The AAAV is designed to provide an over-the-horizon amphibious assault capability for Marine Air-Ground Task Force elements embarked aboard amphibious ships. Once ashore, the AAAV(P) will be an armored personnel carrier providing transportation, protection, and direct fire support. The AAAV(C) will serve as a tactical echelon command post.

The AAAV entered the System Development and Demonstration (SDD) phase in December 2000. Nine months later, delays in completing Developmental Test (DT) and Operational Test and Evaluation (OT&E) resulted in a program baseline breach, which necessitated a Test and Evaluation Master Plan (TEMP) update. This update should have been forwarded to OSD for approval in December 2001. In December 2002, continued programmatic delays caused the Program Office to seek to postpone Milestone C an additional 9 to 12 months.

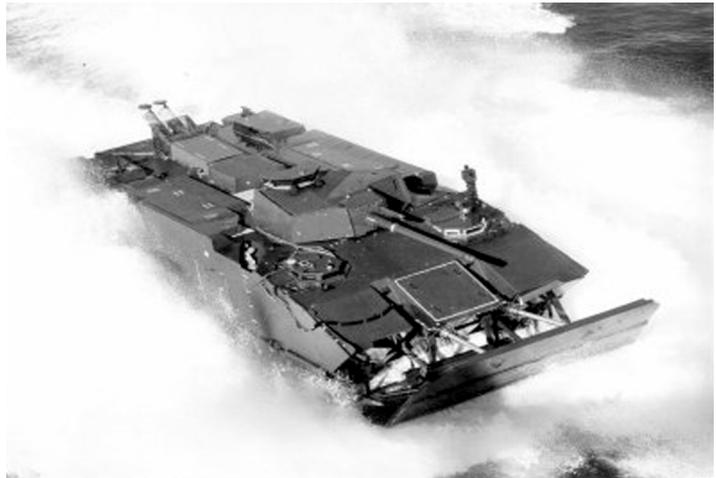
### TEST & EVALUATION ACTIVITY

FY02 Test and Evaluation activities included: DT (land/water mobility and firepower testing) of three Preliminary Design and Risk Reduction (PDRR)-phase AAAV(P)s; and two of three planned Early Operational Assessment (EOA) phases (land mobility testing and gunnery). The amphibious operations phase of the EOA was postponed repeatedly because prerequisite performance in DT relating to operating in the ocean, transiting surf zones, and operating sequentially in water and on land had not been demonstrated. Citing numerous planned design changes and a pressing need for using all the PDRR vehicles to complete essential DT, the Direct Reporting Program Manager (DRPM) recently cancelled the EOA's amphibious operations phase despite DOT&E's objections and advice to conduct this TEMP-required event.

Live Fire Test & Evaluation (LFT&E) activities in FY02 included ballistic validation of new armors, ballistic testing of the Automatic Fire Extinguishing System (AFES) using the Ballistic Hull and Turret (BH&T), and Revision of the LFT&E Strategy.

### TEST & EVALUATION ASSESSMENT

It is essential to note that some concerns stem from testing PDRR AAAV(P)s (which were not expected to represent fully the final configuration) and that corrective fixes have been identified by the DRPM in most cases, but are not yet demonstrated. The extent of these shortcomings was not anticipated. In particular, performance shortfalls in the areas of reliability and troop-carrying capacity appear to be the most significant.



*The Marine Corps' Advanced Amphibious Assault Vehicle underway at approximately 25 knots.*

# NAVY PROGRAMS

Because of a lack of interior volume, PDRR AAV(P)s could not effectively transport 17 combat-equipped Marines. A more realistic transport estimate is 14 or 15 Marines. Demonstrated embarkation and debarkation times are much greater than for the current AAV. Crowding is worse for loads involving infantry crew-served weapons, such as mortars. The capacity of the vehicle is at least 25 percent less than the AAV; thus, if AAV(P)s replacement of AAVs is planned to be on a one-for-one basis, lift (in terms of personnel, their equipment, and essential cargo) will be comparably less. Vehicle modifications that have been proposed are not likely to improve this situation.

During the EOA's limited land mobility testing, the vehicle's land mobility capabilities effectively equaled the main battle tank's and the AAV's on primary and secondary roads. Neither the PDRR AAV(P), nor the AAV, kept up with tanks in moderate cross-country conditions. The PDRR AAV(P) broke down when traversing more challenging cross-country terrain that was passable by both tanks and AAVs.

The AAV's weapon system appears to represent a significant advance over the capabilities currently fielded in the AAV, although this must be confirmed in operationally realistic conditions. The vehicle's thermal sight worked well under nearly all test conditions, including through smoke that completely blinded the AAV's optical sight. The PDRR AAV(P)'s observed probability of hit was below the requirement despite benign firing range conditions. Problems with the gun's ammunition feed system significantly limited the number of rounds that could be loaded.

The vehicle's demonstrated reliability falls short of predictions, almost certainly because the system is mechanically complex and operates in a challenging environment. The Program Office continues to identify root causes and corrective actions for these failures. In the EOA, land mobility and environmental control systems have been the most problematic and led to failures to complete any of the planned operational mission profiles.

In addition to reliability, safety appears to be a major challenge affecting operational suitability. Noise levels limit the amount of time embarked Marines can remain in the PDRR AAV(P) and require those near the vehicle to wear extra hearing protection. Carbon monoxide accumulates in the vehicle during 30-mm cannon firing unless all ventilation systems are operating properly. The temperature inside the vehicle rises to unsafe levels in high ambient temperatures, restricting troop transport and requiring that some electronic components be cooled with cooling packs to prevent overheating.

Several of the vehicle armors were changed as part of the major system redesign and weight-reduction effort that occurred early in SDD. Validation of the new armors for compliance with specifications continued throughout FY02 and is still incomplete. Further ballistic characterization of the vehicle armors, originally planned for FY02, was not conducted due to the redesign effort and the associated schedule slip. This testing is critical to support evaluation of armor performance, and is now planned for FY03.

Ballistic testing was conducted during FY02 using the BH&T to supplement results from earlier AFES DTs. Results from this testing were inconclusive, and further examination of AFES performance at the system level will be required.

Most of FY02 was spent reexamining the AAV LFT&E Strategy approved at Milestone II. Changes are required as a result of the SDD redesign effort and the results of early DT. The strategy, which relies heavily on early developmental or specification compliance testing of components and hardware, requires extensive engineering analysis to link these results to system-level vulnerability. Based on the results of testing to date and the engineering details of the SDD redesign, LFT&E bases identified in the Milestone II LFT&E Strategy are inappropriate for the program, unlikely to lead to satisfactory results in the final full-up system-level (FUSL) live fire test phase, and inadequate to support a comprehensive vulnerability evaluation. Changes to the approved strategy discussed during FY02 include increased ballistic testing against specifically identified AAV-unique components, more test events in the FUSL phase of the program, and addition of actual threat-based ballistic testing against the AAV(C) configuration.

# NAVY PROGRAMS

The Program Manager has agreed to additional component testing, and has identified a second SDD prototype vehicle for use in system-level testing. Remaining concerns include management provisions for the proficient conduct of an independent LFT&E and long-range test and resource planning.

In sum, the AAV program continued to experience programmatic delays resulting in the recent announcement that the testing to support the Milestone C, Low-Rate Initial Production decision has been extended for one year. The primary causal factor has been an unexpectedly inadequate PDRR-prototype performance, which had led both to testing delays (DT and Operational Test) and to a significant SDD redesign, which will require appropriate testing and evaluation. Importantly, the AAV(P) has not demonstrated that it can accomplish its primary mission, that is, transport combat-equipped Marines from an amphibious ship located 20 to 25 nautical miles offshore to objectives located inland without unacceptably degrading their physical condition. The Program Manager's ill-advised decision to cancel the EOA's amphibious operations phase may preclude incorporating fixes from this key early test event into the SDD vehicle design, potentially eliminating one test-fix-test cycle and greatly increasing the risk that operational deficiencies will not be found until the next OT&E phase in FY05.

The performance of an integrated AAV(C) will also not be demonstrated during operational testing until FY05, when the first AAV(C) prototype will be made available. This is high risk, since the AAV(C) is the more technically challenging variant. Finally, concerns remain about the use in the vehicle of the less corrosion resistant aluminum alloy, Al 2519, and the potential impact on life cycle cost.

