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Sea Skimmer

Technology breakthroughs lead to dawn of EFV

If ever there was an idea ahead of its time, the Expeditionary Fighting Vehicle (EFV) might fit the description.

"Marines recognized the need for this vehicle since World War II, but it's only in the last two decades that we've had the technology to support it," said Colonel Keith Moore, EFV Program Manager. He and his team at Woodbridge, Va., are leading the acquisition program for the EFV, a program that falls under the purview of the Marine Corps' Program Executive Office Land Systems.

According to EFV program officials, the vehicle will be the primary means of tactical mobility for the Marine rifle squad during the conduct of amphibious operations and sustained ground combat operations ashore. It will replace the Assault Amphibious Vehicle (AAV). Fielded in 1972, the AAV will be more than 40 years old when the EFV is fielded. Program experts said the EFV enables the Navy and Marine Corps team to project power from the sea base in a manner that will exploit intervening sea and land terrain, achieve surprise, avoid enemy strengths and generate never before realized operational tempo across warfighting functions.

For many years EFV was a concept waiting for a vehicle. Meanwhile, gap fillers were called in to fill the need. At the time the Marine Corps fielded the AAV, it was already viewed as only an interim solution. The Corps needed a fighting vehicle that could self-deploy or be transported ashore rapidly from Navy amphibious assault ships off the coast.

However, the AAV's slow water speed — the same 6 to 8 knots as the Corps' World War II amphibious tractors — limited the buildup of combat power ashore from a sea base. Marine Corps leaders knew even before acquiring the AAV that the ideal vehicle would be a high-water-speed amphibian that also could be effective in combat operations on land. That ideal remained a dream because the sophisticated technology required to achieve such a combination were immature or did not exist.

The turn of the century, Moore said, heralded technology breakthroughs everyone has waited for. As a new set of prototypes are prepared for delivery in 2010, the vehicle's reliability growth program can proceed. Projections call for EFV fielding to start in 2015.

The Colonel looks forward to the day the Corps will have over-the-horizon deployment capability. That means the amphibious vehicles can deploy from ships more than 20 nautical miles from shore. Offering a much smaller profile for enemy artillery and traveling much faster than the AAV — more than 20 knots compared to only 6 or 7 — the EFV's arrival on the beach would be almost stealthy by comparison.

“We’ll have a vehicle designed for the fight of the day,” the Colonel said. “EFV is customized for the folks who need high-speed transit toward the beach. It will also carry those who don’t have seats in other tactical vehicles.”

Moore noted that the EFV will seat 17 warfighters, not coincidentally the same number of people who comprise “a true assault echelon — a reinforced Marine rifle squad — the Marines’ smallest tactical unit. We are the heart of the conventional forces of the Marine Corps, the enabler for joint forcible entry. The EFV also gives us the flexibility to transition from high-intensity to low-intensity conflicts.”

The EFV is essential to the Marine Corps mission, according to General James Conway, Commandant of the Marine Corps. He said, “There are programs that are absolutely and vitally important. One of those is our EFV. Navy ships are not going to go closer than 25 miles to another nation’s shore for reasons that have to do with the security of the ships and the safety of the Marines and Sailors aboard.

“The EFV is actually a sea skimmer,” he said. “It gets up on a plane at about 30 knots or so and gets us to where we need to go pretty quickly.”

Speed represents just one of the EFV’s technological advances. Its once insurmountable design challenges involved its engine, water jets and lightweight composite armor.

The vehicle’s powerful compact diesel engine is a turbocharged version of that used on Germany’s Leopard 2, the United Kingdom’s Challenger, France’s Leclerc and Israel’s Merkava tanks. The basic 1,500-horsepower engine was boosted successfully to the 2,700 horsepower needed for the EFV’s high water speed by adding two turbochargers. This makes it the most powerful diesel engine in the world.

The vehicle’s water jets were largely the result of technology base work done at the Navy’s David Taylor Research Center at Carderock, Md., 10 to 15 years ago. The three-stage water jets are the most advanced in the world.

The EFV’s armor had to be as light as possible to allow the vehicle’s high water speed yet offer a high level of hull protection from enemy machine gun fire and artillery fragments. The answer was composite armor panels made of ceramics, S2 fiberglass and a Kevlar-like woven fabric in three separate layers. The combination weighs less than 20 pounds per square foot compared to typical rolled steel armor that weighs 56 pounds per square foot.

“We’re preparing for where the next war’s going to be,” the EFV Program Manager said. “After years of research and preparation, we’re anxious to put the prototypes through their paces.”



An Expeditionary Fighting Vehicle enters the water to execute test exercises off the coast of Marine Corps Base Camp Pendleton, Calif., in October 2008. Marine Corps Systems Command’s Amphibious Vehicle Testing Branch conducted the testing. *(Photo by Private Daniel Boothe)*



An Expeditionary Fighting Vehicle executes testing maneuvers seven miles off the coast of Marine Corps Base Camp Pendleton, Calif., in October 2008. Marine Corps Systems Command's Amphibious Vehicle Testing Branch conducted the testing. *(Photo by Private Daniel Boothe)*



An Expeditionary Fighting Vehicle moves at high-water speed undergoing cold-weather testing in Alaska's Prince William Sound. *(EFV Program Office photo)*



An Expeditionary Fighting Vehicle moves on land during cold-weather testing at Fort Greely's Cold Regions Test Center in Alaska. *(EFV Program Office photo)*



Marines do some egress testing with the Expeditionary Fighting Vehicle at Marine Corps Base Camp Pendleton, Calif. (EFV Program Office photo)

Notice: For more information on the EFV Program, contact the PEO Land Systems Public Affairs Officer David Branham at (703) 432-4966. The photos listed above are available in high resolution and can be requested from Bill Johnson-Miles at (703) 432-3287.

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