Marines get a NEW ASSAULT VEHICLE

The Expeditionary Fighting Vehicle could be the most powerful and versatile armored transport ever built.

Amphibious assault is one of the U.S. Marine Corps major missions. Unfortunately, the armored landing craft they depend on to "hit the beaches," the AAV71 Amphibious Assault Vehicle, was designed over 30 years ago, a lifetime for military equipment. To make matters worse, military activity in Iraq put two-thirds of the Marines'

The 74,500-lb (fully loaded) EFV will carry 17 armed Marines over 60 nautical miles at up to 29 knots, letting the craft disembark from ships that cannot be seen from shore and with the mobility to reduce the risk from enemy artillery, missiles, aircraft, and boats. In a typical scenario, EFVs would leave an amphibious ship, travel 25 miles to shore, then go another 200 miles at 30 mph, fast enough to keep up with U.S. main battle tanks. If necessary, once ashore, it can transition back to water travel and use rivers or lakes as highways.

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Resources

Videos: EFV in action: *http://tiny.cc/nSpld*
30-mm Bushmaster chain gun in action: *http://tiny.cc/AboHH*

The EFV's main mission is transporting and protecting 17 combat-ready marines. They can enter or leave the armored vehicle by a hatch set in a larger ramp door, as they are doing here, by the larger ramp door, or through the EFV's overhead hatches.

AAV7s through a year's worth of wear every month. And despite efforts to refurbish them, the fleet of 1,057 AAV7s probably won't last much longer than another five to seven years.

Fortunately, there is a replacement in the pipeline, the Expeditionary Fighting Vehicle (EFV), being developed and built under prime contractor **General Dynamics.** It was originally planned to be called the Advanced Amphibious Vehicle and enter service by about 2003. But even though the program was touted as one that would use proven technologies, the task of combining all those technologies and meeting performance and maintenance goals has proven tougher than originally thought. Maintaining funding for the program has also been problematic. Initially, the Defense Dept. wanted 1,025 EFVs at a total cost of $8.5 billion. But technical hurdles added costs and time, so by 2007, the DoD cut the number of vehicles it would purchase to 573 and estimated the revised program would come in at $13.2 billion, in effect a 168% increase in the cost of each EFV. What's more, planners now expect the armored-assault craft to enter service about 2015.

But when testing and development is over and EFVs start rolling off the line, the Marines will be equipped with one of the most-effective and powerful military vehicles in the field.

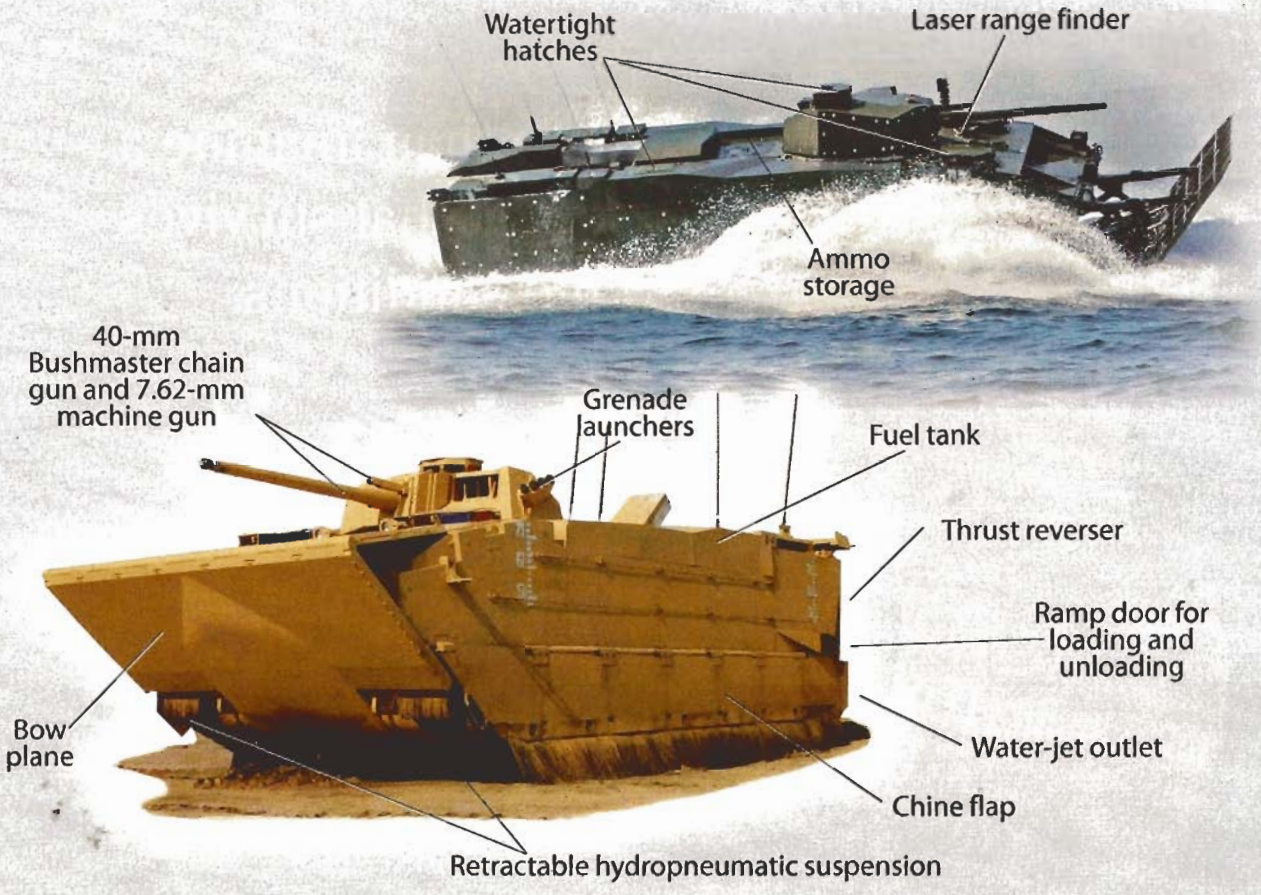
On land and sea

The EFV will be powered by a 2,700-hp, 12-cylinder turbocharged diesel that can burn a variety of fuels. When traveling on land, the water-cooled engine mounted in the center of the EFV puts out 850 hp (@ 2,600 rpm) which gets sent through a six-speed Allison transmission on its way to a pair (left and right side) of lightweight aluminum tracks. The EFV has a top speed of 45 mph on land. The continuously molded band track developed by **Goodyear** is said to have the strength and traction of the heavier, standard block-type tracks, and delivers better mileage and a more comfortable ride. The vehicle's seven pairs of road wheels mount on an actively damped hydropneumatic suspension with built-in ride-height control.

On the water, the transmission sends up to 2,575 hp (@ 3,300 rpm) to a pair of 23-in.-diameter counterrotating water jets, each generating about 11,400 lb of thrust, enough to send the EFV across water at almost 30 knots. The EFV can handle seas with 2-ft waves on open waters, 8 ft of plunging surf when coming ashore, and right itself after rolling 100°. Reserve buoyancy is 30%. (Reserve buoyancy is the volume of the EFV which is watertight and above the waterline. It increases buoyancy if the EFV sinks deeper than normal into the water.)

Steering on water is handled by moving a series of deflectors, a simpler and lightweight solution compared to using vectoring nozzles. The transmission also makes it simple to go from water to cross-country travel by automatically transferring power from the jets to the tracks based on what the transmission senses is needed. For example, when the craft hits a coral mound while traveling across water, most power would be sent to the tracks rather than the jets. Then once the EFV passed the coral, power would return to the jets. The powertrain and driv-

USMC Expeditionary Fighting Vehicle



eline absorb transition shocks when rapidly shifting from one mode to another, which can happen when traveling 10 knots. Going into the water also means the prow plate juts forward and the tracked wheels retract, giving the vehicle a more hydrodynamic profile. And to keep the 74,500-lb vehicle afloat, five bilge pumps, two electric and three hydraulic, come online. The EFV carries 400 gallons of fuel, giving it a 300-mile land range or 65-mile range on water.

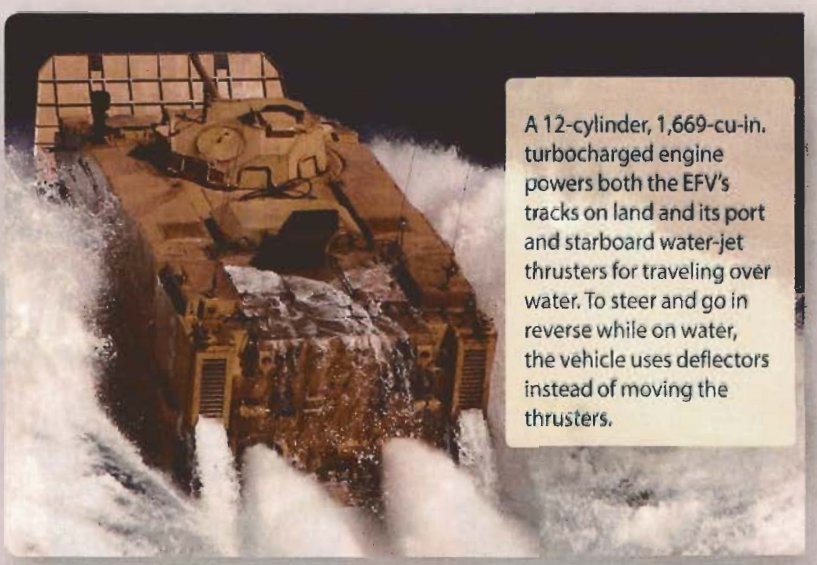
The hull, which measures 10.5-ft tall, 12-ft wide, and 30-ft long, is constructed of 2519-T87 aluminum, a high-strength aluminum-copper alloy. The EFV also carries lightweight modular armor that protects against rounds up to 14.5 mm and fragments from 155-mm artillery shells, which should also help against armor-piercing rounds, RPGs, and IEDs. Inside, seats for 20 Marines (a reinforced rifle squad and three EFV crewmen — vehicle commander, gunner and driver) carry mine-blast protection, along with extra padding and seat belts. The EFV interior is also air conditioned and equipped with automatic fire extinguishers and a nuclear, biological, chemical protective system. The NBC system pressurizes the inside of the hull to slightly higher than ambient so that contaminants are kept out.

Military planners are somewhat concerned about the EFVs relatively high 16-in. clearance, believing it could leave the vehicle vulnerable to IEDs. But Marines on the planning team argued that to give the EFV a V-shaped hull, one that would better protect it from mines and explosives, would either limit its speed on water or force an expensive redesign. As a compromise, the Marines propose that once ashore, EFVs be fitted with belly armor.

Weapons

The firepower for the EFV is housed in a two-man, electrically powered and stabilized turret. The main weapon, aside from the lean-and-mean Marines onboard, is a 30-mm MK44 Bushmaster chain gun from **Alliant Techsystems.** (A chain gun uses external power to send rounds into the chamber rather than rely on expanding gases from the previously fired round. In this case, the gun uses a 1-hp motor to turn a chain that chambers rounds.) It can fire 200 rounds/min to a range of about 6,000 ft, and boasts a 90% hit probability on targets 3,600 ft away while the EFV is moving.

The cannon fires a variety of munitions, including air-



A 12-cylinder, 1,669-cu-in. turbocharged engine powers both the EFV's tracks on land and its port and starboard water-jet thrusters for traveling over water. To steer and go in reverse while on water, the vehicle uses deflectors instead of moving the thrusters.

burst rounds that can be fuzed or programmed to detonate at specific ranges. The gunner sights a target, gets the distance from a laser range finder, then sets a detonation distance milliseconds before a round is chambered. The round itself then counts how many times it spins, converts that to a distance, and detonates at the proper range. This lets gunners program rounds to detonate after plowing though a concrete wall so that it inflicts maximum damage on enemy personnel and equipment rather than the structure. Or they can set rounds to explode above a reinforced emplacement.

The gun weighs 344 lb, and generates 8,000 lb of recoil when fired. It will carry 200 ready rounds of ammo with 400 more stowed away onboard. If a weapon upgrade is ever needed, the barrel can quickly be exchanged for a 40-mm version.

The EFV also carries an M240 7.62-mm coax machine gun. Coax refers to the fact that is mounted to fire in line with the main cannon. There will be 600 ready rounds for

the machine gun inside the hull and another 1,600 rounds stowed elsewhere. There are also 16 grenade launchers on the turret and 16 on the hull.

Inside the EFV

Although the EFV was designed to carry 17 Marines and gear, it can also be used to haul cargo. It can move about 8,150 lb of cargo if there are no passengers. And if it has to, the EFV can tow up to 43,500 lb. Although there were no specific requirements for the EFV to transport mortar crews and gear, General Dynamics has made accommodations to carry the extra weapons and ammo.

The EFV crew have access to three VHF radios, at least one satellite-based communication system, and a myriad of military nets and data links. To stay current with the situation directly outside, the crew can look outside through one of five periscopes, which give overlapping 360°

Quarters are relatively tight inside the EFV, as can be seen looking at the driver's cockpit. It looks a bit roomier inside the Command version of the EFV which will be equipped with seven battalion or regimental staff stations with access to military communications and data links.

coverage, or a night-vision scope.

Of the 573 EFV scheduled to be built, 50 will be so-called command variants. Each of these will carry a crew of three plus workstations for seven battalion or regimental-level staff. The Command version does not carry the 30-mm cannon. Current military thinking is that an EFV platoon will consist of 13 personnel-carrying versions and one command vehicle. **MD**