

The Engineer Bradley Fighting Vehicle

By Chester A. Kojro

This is the third in a series of articles concerning a possible replacement for the M113A3 armored personnel carrier (APC) for mechanized combat engineers. The November 1998 issue of Engineer presented preliminary observations from the field. In March 1999, Engineer published a white paper stating why engineers need the Bradley Fighting Vehicle (BFV). This article describes the U.S. Army Engineer School's efforts to field the Engineer Bradley Fighting Vehicle (E-BFV) to replace the APC.

Engineers support the maneuver brigade commander's scheme of maneuver as part of the brigade combat team in the close fight. They also fight as infantry, and mechanized engineers fight as mechanized infantry. Engineers and infantry have always been linked: they have marched, ridden, and fought together with the same equipment. In World War II, both used armored halftracks; and during the Cold War, both used APCs. In the future, both will use the yet-to-be-defined Future Infantry Vehicle. It is only now that engineers are equipped with a distinctly less-capable vehicle than the infantry soldiers they accompany and support.

The Problem

The M113A3 APC is an excellent armored carrier and will remain a fully capable "battlefield taxi" throughout the foreseeable future. However, it does not belong in the forward edge of the combat team. The APC cannot defend itself on today's mechanized battlefield, much less on future battlefields to be faced by the Force XXI Conservative Heavy Division and Army After Next. Engineers cannot keep up with the tank and mechanized battalions they support. Engineers are readily identifiable on the battlefield and, because they lack a defensive capability, are often singled out for destruction by enemy forces.

Like tanks, mechanized Infantry Fighting Vehicles have modern, lethal cannons and missiles with full-solution fire control; stabilized thermal sights; and an armor-protected, shoot-on-the-move capability in all weather and visibility. They also have survivability enhancements that protect the crew after the hull is penetrated. Meanwhile, accompanying engineers in their APCs must expose themselves to fire to manhandle a single, flex-mounted .50-caliber machine gun. They have nothing but their eyes for fire control and cannot expect to penetrate and defeat enemy armored fighting vehicles even if they are lucky enough to score a few hits.

Engineers carry a lot of equipment and materiel—mines, explosive demolitions, barrier materials, and special tools—as well as specialized obstacle-breaching systems, such as mine-clearing line charges (MICLICs). The current "solution" is for engineer squad APCs to pull cargo trailers, which creates more problems. The added weight overtaxes engines and drive trains, and maintenance problems multiply. APCs are less agile with trailers attached because the trailers may jackknife and flip, especially when traveling cross-country. In addition, trailers block the APC's rear ramp, making it difficult to exit a damaged or burning vehicle.

The Solution

The solution to these problems is the Engineer Bradley Fighting Vehicle. Table 1, page 19, shows major milestones in the effort to field such a vehicle.

Table 1

Engineer Bradley Fighting Vehicle History	
Mid-1980s	Under the Armored Family of Vehicles (AFV) program, engineers pursued the Sapper Vehicle (SV), a variant of the yet-to-be-defined Infantry Future Fighting Vehicle. Under this program, all vehicles were to have a turreted cannon. The SV was to have a dozer blade, backhoe, hydraulic auger, and hydraulic power tools.
1988	Many of the tools and systems were incompatible and were trimmed from the SV. The turret was replaced with a commander's weapon station. The backhoe was removed because it would tie the vehicle to the work site rather than to an overwatching position. The AFV program was downsized, reorganized, renamed, and finally disappeared due to lack of funding, but the conceptual SV remained.
Late 1980s	The Canadian Special Engineer Vehicle (SEV)—an M113 with a dozer blade, hydraulic auger, and hydraulic tools—was considered. The blade had a flotation backing that allowed it to float and serve as a trim vane, so the vehicle could swim like a conventional APC. As with the SV, hydraulics to power the blade and auger reduced interior volume needed for the engineer squad's equipment, so interest in the SEV never developed.
1994	The Engineer School developed a mission need statement for an Engineer Squad Armored Carrier. The focus was on the need to maneuver (and survive) alongside Infantry Fighting Vehicles and tanks and the need for a large cargo capacity. Analyses pointed to a stretched APC or a turretless Bradley. In the stretched M113A3, the hull was cut and an extra 3-foot section inserted. The APC also had an extra (sixth) road wheel and an uprated engine. The turretless Bradley allowed extra space, but the turret ring's gaping hole had to be replaced with a new top deck with a commander's weapon station and crew/cargo hatches. Hull wiring that previously ran through the turret slip rings required rerouting, and new positions for radios and controls had to be developed.
December 1995	The stretched APC was the preferred solution of the two and was so briefed to the Army Vice Chief of Staff. But it was still a defenseless vehicle, even though the trailer was eliminated.
1997	MG Gill, Engineer School Commandant, directed that an operational concept be prepared for the Bradley Engineer Squad Vehicle, including an assessment of DTLOMS.
July 1997	The operational concept was submitted to TRADOC.
January 1998	The operational concept was endorsed by TRADOC, but implementation was deferred pending a more detailed assessment of resource impacts. According to the concept, BFVs would replace all engineer APCs in divisional battalions of active component (AC) divisions and Army National Guard (ARNG) enhanced brigades and in engineer companies of Armored Cavalry Regiments (ACR). Engineer corps mechanized battalions and ARNG divisional battalions were not included because they were to be reorganized under the Army's Force XXI effort. The total requirement was estimated to be 1,005 vehicles. Eliminating squad trailers would result in a need for additional cargo vehicles and drivers.
Summer 1998	No decision was made at HQDA, and attention shifted to the Army's Heavy Force Modernization Plan. Engineer School representatives to the working group for the plan raised the E-BFV issue, but a decision was deferred because the requirement was unfunded.
October 1998	MG Flowers, Engineer School commandant, directed that a white paper be written stating why engineers need the E-BFV (see *Engineer*, March 1999).
December 1998	TRADOC directed the Bradley proponent, the Infantry School, to prepare a recommendation on the feasibility of an E-BFV.
May 1999	TRADOC approved the infantry/engineer assessment and the E-BFV operational concept, which has changed considerably since the 1997 concept.

Advantages

Engineers mounted in E-BFVs would gain the following:

- Survivability through lethality (defensive fire from the tube-launched, optically-tracked, wire-guided missile [TOW] and 25-millimeter cannon).
- Improved situational awareness (armor-protected turret with enhanced optics and forward-looking infrared).
- A common signature (to prevent the enemy from specifically targeting engineers and to reduce fratricide)
- Improved cross-country mobility (for example, crossing gaps).
- Logistics and maintenance commonality with the brigade combat team.

Considerations

Some of the logic concerning which Bradley Fighting Vehicle model is needed follows:

The original M2A0 model is obsolete, and existing M2A0s are unsuitable. Practically everything on them has been upgraded or modernized, so there is little maintenance commonality with later models. Their age and mileage would make them a readiness nightmare.

No M2A1s remain, since they have all been upgraded to M2A2 or higher.

During Operation Desert Storm, needed improvements to the M2A2 were identified, which resulted in the M2A2 ODS (Operation Desert Storm). Improvements include an eye-safe laser range finder, a Global Positioning System/digital compass, missile countermeasures, enhanced driver's thermal viewer, internal restowage, and mounting provisions for Battlefield Command Identification System. The M2A2 ODS is the current frontline infantry vehicle. When upgraded with a "digital applique," it will be compatible with Force XXI digital requirements.

As AC infantry units receive the M2A2 ODS, their M2A2s are being cascaded to ARNG infantry battalions. Diverting these vehicles to AC engineer battalions would derail ARNG modernization, to which the Army is fully committed.

The M2A2 is suitable for today's engineer, but it needs upgrades to be compatible with the digitized applique required under Force XXI. This would create a sort of M2A2 "hybrid" that would be "almost an ODS" but not quite. It would cost about the same initially and less in the long run to select the M2A2 ODS configuration for engineers.

Under Conservative Heavy Division redesign, tank and infantry battalions are smaller by one line company each. Excess M2A2 and M2A2 ODS models are being turned in and will be rebuilt to the yet-to-be-fielded M2A3 configuration. The M2A3 will be fully digitized and will be interoperable with the M2A2 ODS (w/applique). Only a limited number of M2A3s will be fielded, and none are available for engineers. Retaining the division's excess M2A2 and M2A2 ODS models for engineer use is not acceptable since it would derail the M2A3 fielding schedule. (One engineer battalion equivalent—about 30 BFVs—had been retained at 4th Infantry Division at Fort Hood, Texas, but this was a temporary exception.)

Given all of these considerations and constraints, the agreed-upon plan is to use excess M2A0 BFVs and upgrade them to the M2A2 ODS configuration. Except for removing the internal TOW racks, the E-BFV will be identical to the infantry M2A2 ODS. Once the digital applique is fielded, the E-BFV will be operationally compatible with the digitized brigade combat team of Force XXI.

Table 2 shows the breakdown for the 668 Bradleys required for conversion under the Heavy Force Modernization Plan.

Table 2

Bradleys Required for E-BFV Conversion			
Type of Unit	Number of Units	Quantity Per Unit	Total Requirement
AC Divisional Engineer Battalions	18	29	522
AC Armored Cavalry Regiment Engineer Company	1	13	13
Pre-positioned Battalion Sets	3	29	87
National Training Center	1	20	20
Engineer School	1	22	22
Infantry School	1	4	4
Total			668

Table 3

DTLOMS Impacts of the Engineer Bradley Fighting Vehicle	
Doctrine	Field and training manuals will be revised to reflect added engineer capability. These include FM 5-10, *Combat Engineer Platoon*; FM 5-71-2, *Armored Task Force Engineer Combat Operations*; FM 5-71-3, *Brigade Engineer Combat Operations (Armored)*; FM 5-71-100, *Division Engineer Combat Operations*; MTP 5-335 series, *Engineer Topographic Units*; FM 71-1, *Tank and Mechanized Infantry Company Team*; FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*; and 71-3, *The Armored and Mechanized Infantry Brigade*. Tactics, techniques, and procedures (TTPs) also will be revised.
Training	The Engineer School will adjust training for 12B10 One-Station Unit Training, 12B30 Basic Noncommissioned Officer Course, Career Management Field 12 Advanced Noncommissioned Officer Course, Engineer Officer Basic Course, and Engineer Officer Advanced Course. Engineer NETT will be raised and resourced.
Leader Development	Engineer master gunners and engineer Bradley Leader Course graduates will be assigned an additional skill identifier and tracked accordingly.
Organization	M113A3 APCs will be replaced one-for-one. There will be no change to engineer platoon, company, and battalion structure, and no personnel or vehicles will be added to the engineer battalion. Forward support maintenance will need six additional mechanics per engineer battalion (18 mechanics per division with three engineer battalions).
Materiel	The E-BFV is essentially identical to the Infantry's M2A2 ODS Bradley, with only minor changes to the internal stowage configuration.
Soldier	Engineer units will be more capable. They will be more survivable through improved lethality, situational awareness, and armored protection.

Impacts

Due to other changes associated with Conservative Heavy Division redesign (independent of the E-BFV issue), acquiring the E-BFV will not significantly impact equipment and personnel at the battalion level. All positions will be satisfied through redistribution of available personnel, and no added vehicles are needed. At the division level, there is an increase of six mechanics per engineer battalion or 18 per division. So the six AC divisions require an additional 108 mechanics.

Training will be impacted based on the increase in firepower (25-millimeter cannon and TOW) and sophistication of the fighting vehicle overall. New equipment training teams (NETT) will provide initial training. Engineers will conduct semiannual gunnery using common tables I through VIII and engineer-specific tables XI and XII. Engineers will also conduct one combined arms live-fire exercise and two field training exercises annually. All training for the TOW will be conducted using simulators and training devices rather than live missiles. Each engineer battalion will have one set of training aids, devices, simulators, and simulations, which consists of Conduct-of-Fire Trainer, Precision Gunnery System, and Through-Sight Video.

Engineer master gunners will be trained at the U.S. Army Infantry Center's Bradley Master Gunner Course. Engineer leaders initially will be trained at the Infantry Center's Bradley Leader Course until an engineer-specific course is taught at the Maneuver Support Center at Fort Leonard Wood, Missouri. Course scheduling will depend on the E-BFV fielding schedule. During initial low-rate fielding (less than 60 per year), training will continue at Fort Benning, Georgia. Engineer-specific training will begin at Fort Leonard Wood as fielding expands to two or more battalions (60 vehicles) per year.

Table 3 shows how transitioning to the E-BFV will impact DTLOMS.

The Result

While specific milestones have not been determined at this time, Engineer School personnel are hopeful that E-BFV fielding may begin as soon as 2004. With this vehicle, engineers will shoot, move, and communicate as fully capable members of the brigade combat team of the Force XXI Conservative Heavy Division design. They will be in line with the infantry for further transitions to follow-on combat systems such as the Future Infantry Vehicle and Future Combat Vehicle of the next two decades. With comparable equipment, engineers will finally return to their position alongside the infantry as they enter the close fight at the tip of the brigade combat team.

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