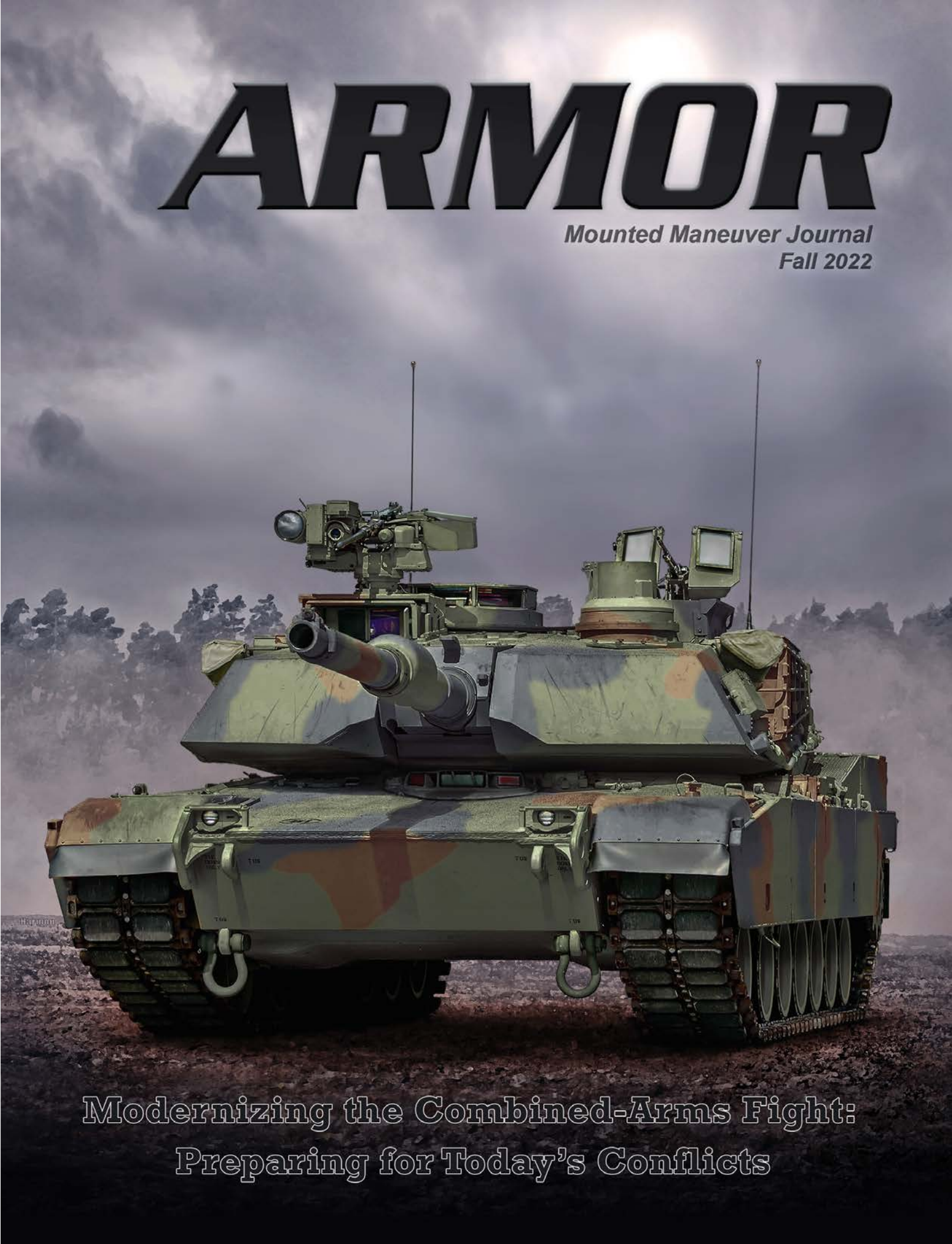
ARMOR

Mounted Maneuver Journal
Fall 2022



Modernizing the Combined-Arms Fight: Preparing for Today's Conflicts

ARMOR

The Professional Bulletin of the Armor Branch, Headquarters, Department of the Army, PB 17-22-4

ARMOR (ISSN 0004-2420) is published quarterly by the U.S. Army Armor School, McGinnis-Wickam Hall (Bldg. 4), Suite W141A, 1 Karker Street, Fort Benning, GA 31905.

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LETTERS

Dear Editor,
As I attended a Noncommissioned Officer Education System course at a different installation last month, I could hear tanks firing in the distance. So I did what any master gunner would do – I figured out who was running the range and stopped by to enjoy the sights and sounds of a tank battalion firing gunnery.

As I watched from the tower, the crews fired a pair of engagements from the first defensive positions. I could tell the commander in the left lane was experienced; he and his gunner quickly identified their targets and pulled up to engage near troops and a far mover in rapid succession. The platoon leader in the right lane took longer to acquire his target but likewise pulled up and had a solid first engagement.

Both tanks exited their battle positions and prepared to move down the lanes for the next engagement. "Two frontal tanks in the offense," I was told.

I watched the first tank begin its movement, accelerating to 3 to 4 mph. As the targets locked downrange, the tank slowed to a halt and fired. The tank began to accelerate, pulling into the cloud of obscuration it had just created, finally identifying the second target and stopping again to engage it as the initial obscuration cleared several seconds later.

I turn to the right lane. The platoon leader and his crew take off, perhaps hitting 5 mph before stopping to engage both targets from a single halt.

"Is this their degraded engagement? A stabilization failure?" I asked.

"No, it's full-up. These crews just aren't confident firing on the move," I was told.

At this point I was dumbfounded. I was on a premier Digital Multipurpose Range Complex, watching the latest and most capable tanks in the Western world, M1A2SEPv3s, stop and shoot like they were the same tanks that patrolled the plains of Western Europe in the 1960s.

Tank development has been driven for more than 100 years by three critical design requirements: mobility, protection and firepower. The Armor Branch provides a unique combination of capabilities found nowhere else in the armed forces, and we are expected to provide those capabilities anywhere, anytime, bar none. Untold millions of dollars and years of research and development have been invested to ensure the tanks the United States puts on the battlefield will not have to stop to fire, making them easy targets for enemy tanks and anti-tank guided missile (ATGM) teams. The combination of speed and armor that the Abrams tank provides our crews creates a unique level of survivability on the battlefield.

Ranges have been built and modernized, and backstops and firing boxes designed, for crews to operate their vehicles at combat speed and still fire accurately on the move and hit their targets.

Firing on the move at realistic speeds provides several advantages. Driving with increased speed makes it more difficult for enemy gunners to track and engage your vehicle. Increasing your speed and staying in second or third gear begins to close the distance between your vehicle and the enemy, giving your gunner a larger target and a higher hit probability.

During gunnery, your distance-to-target is graded at the midpoint of the maneuver box, which some crews never reach. This means you are forcing yourself to fire a more difficult engagement and be graded more harshly by simply moving slow or stopping. Driving at a faster speed helps your vehicle pass through obscuration quickly, allowing quicker identification and engagement of subsequent targets.

Chapter 4 of Training Circular 3-20.31, ***Training and Qualification Crew***, states that crews are expected to travel at between 20-30 kph (12-20 mph) to provide a stable firing platform. Stopping your vehicle keeps you farther from your targets, and the time it takes to decelerate to a stop and fire takes longer than simply maintaining a stable speed and firing on the move.

It is no secret how vulnerable a tank can be on the modern battlefield. Unskilled forces sticking to simple movement techniques and lacking confidence and training on their platforms are easy targets for enemy ATGM teams, dug-in armor and precise indirect fires. Gunnery simulators are available 24 hours a day, seven days a week at home station. If your unit is in the field, there should be no such thing as an administrative move. Every gunner should have their guns depressed and practice their tracking and manipulation of the fire-control system while on the move.

Tank crews that are trained, confident in the capabilities provided by their platforms and audacious enough to maintain their tempo and maneuver against their opponent can overcome these modern threats and destroy enemy forces, winning the day.

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Office of the Chief of Armor,
U.S. Army Armor School

Acronym Quick-Scan

ATGM – anti-tank guided missile

CHIEF OF ARMOR'S HATCH

BG Thomas M. Feltey
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Understanding Our Masking Limitations

The conflicts of the last decade suggest an ongoing change in the nature of war. For example, imagery from the 2020 Nagorno-Karabakh border conflict between Armenia and Azerbaijan, and the ongoing war in Ukraine tend to highlight the role of sensor technology and long-range precision fires. However, while the innovative use of new and emerging technology demonstrates the availability of new tools for waging war, it does not eliminate the need for opposing forces to meet in combat. Nor does it invalidate the importance of cavalry to see, find and shape the battlespace to enable maneuver units to achieve points of advantage from which to inflict shock and destruction upon their enemy.

Nevertheless, realizing these effects consistently on tomorrow's battlefields necessitates updates to small-unit doctrine and the ***Armor Training and Standardization Strategy 2030 (Armor 2030)*** to reflect an understanding of emerging technologies and their effects. Fortunately, the recent publication of Field Manual 3-0, ***Operations*** – with its clear description of the multidomain environment and how the Army will conduct large-scale combat operations – provides an anchor point for these modifications.

The ability to mass our combat power at positions of advantage requires that we preserve those forces in the defense and on the move. The enemy is increasingly effective at finding forces using optical, thermal, electronic and acoustic detections systems, noted retired COL John Antal in a phone interview in December 2022. These intelligence-collection assets then facilitate the employment of precision fires to reduce the combat power of friendly forces, preventing their transition to an offensive posture. As an Armored Force we need to understand our own masking limitations in those four areas. Updating both our camouflage and noise dampening of our vehicles; reducing our electromagnetic signatures; and decreasing the persistent use of radios will allow us to minimize the chance of enemy detection.

First, we need to understand how we look to the enemy. Soldiers and leaders at the small-unit level cannot effectively address weaknesses until they clearly understand how the enemy sees our friendly forces.

Second, we need to consolidate the lessons-learned from home-station training and combat-training-center rotations and distribute them to the force. Communicating these lessons-learned allows the armored community to reiterate and refine these techniques to degrade the effectiveness of our adversaries.

Defensive operations allow our units to build combat power and transition to offensive operations, maneuvering forces into a position of advantage to deliver precision fires against our enemies. Preserving our forces requires us to plan dispersed and with reduced signatures, quickly disseminate orders, consolidate converging forces and move directly into the fight. To do so, maneuver leaders must understand how the enemy will use emerging technologies to identify our forces on-the-move and reduce our combat power prior to direct engagement.

Clear understanding of how units will maneuver through various domains to meet the enemy is critical to preserving the force. Reacting to enemy-reconnaissance elements and contact across all domains is critical to limiting the effective targeting of our forces. Once friendly forces have maneuvered to the position of advantage, our ability to overwhelm the enemy through fire and maneuver ensures mission success.

As the Maneuver Center of Excellence and the U.S. Armor School develop plans to update training and doctrine, the operational force can influence those documents by communicating small-unit innovations across the force. Units attending combat-training-center rotations and conducting home-station training allow young Soldiers and leaders to develop tactics that address some of the challenges discussed in this article. Publishing those findings allows leaders and planners to engage in discourse further encouraging experimentation across the

force. Continued iteration is vital to developing the best tactics and doctrine to be used by the Maneuver Center of Excellence and U.S. Armor School.

Innovations to our tactics that account for emerging technologies allow us to update doctrine and the ***Armor Training and Standardization Strategy 2030***, so we are prepared to meet the challenges of the modern battlefield. Understanding how our enemies see and target our combat power; updating our tactics for preserving the force; and training to ensure we can maneuver to a position of advantage will allow us to win in close combat of the future. Developing a comprehensive strategy for updating our training environments, small-unit tactics and doctrine requires leaders from across the Army to share lessons-learned in training and engage in discourse to meet the challenges of future combat.

Russia's Developing Tank-Support Combat Vehicle Concept

by Dr. Charles K. Bartles and Dr. Lester W. Grau

"An analysis of the military political situation testifies that in the current stage of the developing threats arising from military conflicts, it is significant that, in the conduct of land battle, tanks still will play one of the major roles as the main strike force of the ground troops. The Russian 'special military operation' in Ukraine, as well as the large quantity of tanks in the armed forces of many other countries in the world, supports this conclusion."[1]

During an offensive, tanks are the primary means for destruction of the defending enemy, capturing important positions and important boundaries on the forward edge of the battle area, and capturing other areas and objects throughout the depth of the defense. In combined-arms combat, tanks have traditionally worked closely with mounted infantry and their *boyeva mashina pekhoty* (BMP; Russian infantry fighting vehicle) or the *bronetransportyor* (BTR; Russian armored personnel carriers) to protect tanks from anti-tank guided missiles (ATGMs).

Unfortunately, the BMPs have less armor than the tanks they support and hence are vulnerable to weaker munitions. In urban areas, motorized rifle troops are often dismounted, significantly decreasing the speed that combined-arms formations advance, inviting heavier casualties.

Due to the increasing prevalence and lethality of ATGMs, the Russians have been keenly interested in finding other ways of increasing the survivability of tanks without relying exclusively on motorized rifle formations, which are increasingly more difficult to man due to Russian demographic issues. As previously discussed in previous issues of ***ARMOR***, the Russians have opted for the *boyevaya mashina podderzhki tankov* (BMPT; tank-support combat vehicle "Terminator") to fill this niche.[2]

BMPTs' first combat: Syria, Ukraine

The BMPT first saw combat in Syria in 2017, where details of its performance were sparse, but were reported to not only be successful but also more efficient at supporting tank operations than BMPs and BTRs.[3] Russian Deputy Defense Minister Yuriy Borisov said the BMPTs' success in Syria was the impetus for Russia's decision to procure the system for the Russian ground forces. The BMPT completed state trials later that year and the go-ahead was given for serial production.[4] BMPTs first appeared in the Russian ground forces in 2018, but the first BMPT company, in 90th Tank Division, was not reported until 2021.[5]

The early days of Russia's 2022 invasion of Ukraine, characterized by much urban warfare, would appear to have been the ideal conditions for the BMPT's employment, yet the system did not see combat in the conflict until May 2022, when the first reports and videos of the BMPT began to surface.[6]

According to ***RIA Novosti*** (a Russian state-owned domestic-news agency), the BMPT is performing well and is working with tank platoons to destroy Ukrainian fighting positions, armored vehicles and ATGMs. The battlefield in Ukraine is providing an opportunity to develop BMPT tactics and integrate its use in the combined-arms concept.[7] This success is reportedly due to the BMPT's offensive and defensive capabilities.

Regarding offensive capabilities, the BMPT has a better field of fire and visual range than tanks, increasing the crew's situational awareness. It also has a multi-channel weapon system that can quickly lock its weapons on targets and simultaneously fire at four to five targets.

RIA Novosti quoted an "informed source" who stated, "All this increases the effectiveness of tank units, especially when operating in a city where enemy infantry with anti-tank weapons can fire from unexpected angles, including from above. The BMPT has

Figure 1. Tank-support combat vehicle (BMPT). *(Photo copyright Vitaly Kuzmin. Licensed under a Creative Commons Attribution-NonCommercial-International License No Derivatives 4.0.)*

time to respond to these threats and suppress them, including the fire of dual 30mm cannons that penetrate the walls of houses."[8]

Regarding defensive capabilities, a major Russian concern before the start of the "special military operation" was the Ukrainian acquisition of North Atlantic Treaty Organization (NATO) antitank weapons such as the United States' Javelin ATGM and the United Kingdom's Next-Generation Light Anti-Tank Weapon (NLAW) ATGM. According to ***RIA Novosti***, another "informed source" stated that the BMPT could withstand Javelin and other Western ATGMs: "The experience of military operations shows that the BMPT 'Terminator,' due to its increased protection, can withstand the hit of the Javelin anti-tank system as well as other NATO-made anti-tank systems and grenade launchers. After these attacks, the BMPTs needed minor repairs in the field, so combat capability could fully be restored."[9]

Despite Russian pronouncements about the effectiveness of the Russian military and equipment during the "special military operation" – which are notoriously unreliable and in many cases are demonstrably false – the Russians' continued discussion of the BMPT concept suggests that the Russians perceive the BMPT's performance favorably.[10]

BMPT and Russian force design

In the past, discussion of the BMPT's organizational structure in the Russian ground forces revolved around three options: a single BMPT in a tank platoon, a BMPT platoon in a tank company or a BMPT company in a tank battalion. It appeared that Russia was planning to adopt the last option, although in regular practice the BMPT platoons in the BMPT company would be attached to tank companies, or individual BMPTs would be attached to tank platoons. But in the September edition of ***Armeisky Sbornik***, a Russian armor expert posits that BMPT battalions should be fielded in each tank regiment, and presumably each tank brigade.[11]

Figure 3. A United Kingdom Soldier launches an NLAW. *(United Kingdom Ministry of Defence photo licensed under the Open Government Licence version 1.0)*

If Russian military theorists are discussing "upsizing" BMPT units from company to battalion level, it lends credence to the idea that the BMPT concept and performance are perceived to be sound. Although there may now be discussion of BMPT battalions instead of just BMPT companies, it is important to note that Russian force planning still envisions an approximately 1:3 ratio (one BMPT per three tanks) as ideal. Instead of one BMPT company supporting a tank battalion, the current schema envisions one BMPT battalion supporting three tank battalions, with BMPT companies, BMPT platoons and individual BMPTs being attached to tank battalions, tank companies and tank platoons, respectively.

Since all tank units will almost certainly not have BMPT support, the "upsizing" of BMPT formations suggests the BMPT will be fielded in greater numbers than initially anticipated. It is also important to keep in mind that the use of BMPTs does not mean the Russians intend to abandon the use of combined-arms units in favor of tanks and BMPTs. Rather, tank and motorized rifle units will still provide mutual support, but the way this support will be organized will differ due to the capabilities that the BMPT provides to the combined-arms formation. The implementation of this new system is still in its infancy, but Russian tacticians are planning for it, as will be described.

Figure 2. U.S. Soldiers fire an FGM-148 Javelin. *(U.S. Army photo)*

Possibilities for BMPT employment

Traditionally during an offensive, a tank battalion is usually reinforced with one or sometimes two motorized rifle companies. Generally, the tanks form the first echelon, with the second echelon consisting of BMPs/BTRs, followed by their dismounts standing off at 200 meters or moving from covered position to covered position. But

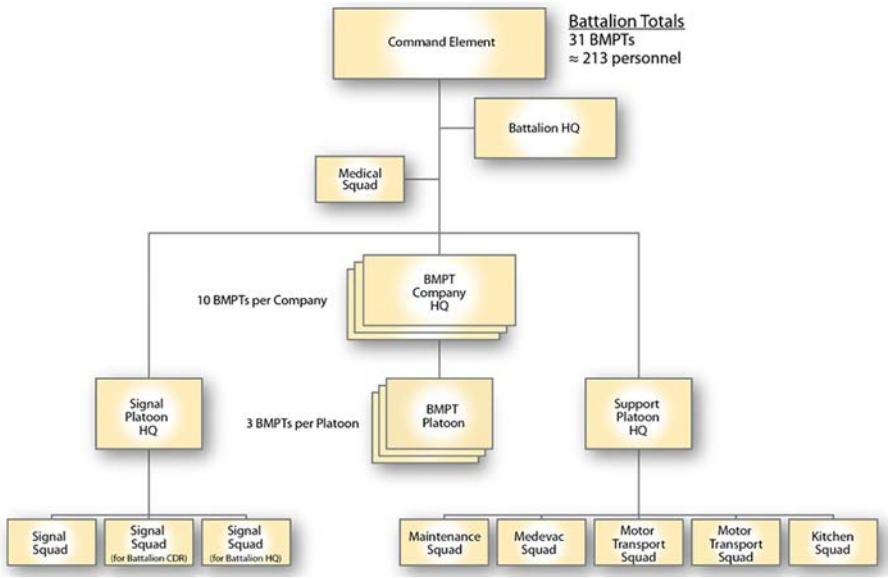

Figure 4. BMPT battalion. *(U.S. Army graphic by Dr. Charles K. Bartles)*

BMPTs, when present, can be in the first or second echelons of a combined-arms reserve, remain directly subordinate to the battalion commander, and in urban operations can be part of the assault group. BMPTs will permit the more lightly armed and armored BMPs and BTRs to still provide support but stay farther behind the line of contact.

When acting as part of first-, second- or third-echelon battalions, the BMPT conducts fire support and destroys the enemy, focusing on enemy antitank systems. In a combined-arms reserve, the BMPT will repel enemy counterattacks, defend flanks and deal with unforeseen contingencies. When directly subordinated to a battalion commander, BMPTs destroy enemy personnel, means of fire, armored vehicles and tanks; support the actions of the first and second echelons (when they are engaged in battle); and cover the flanks.

The current opinion of Russian tacticians is that BMPTs are generally most effective when employed in the same echelon as tanks. In this scheme of maneuver, BMPTs can provide close-fire support for tanks by effectively destroying enemy antitank weapons both at the forefront and throughout the depth of the enemy's defense. The decision about the exact nature of BMPT employment depends on variables relating to the combat mission; intent of the senior commander; and composition, state and position of the enemy.

Variant 1. In this variant, a BMPT is placed at equal intervals (1:3) between the tanks of the formation, with the BMPT platoon commander situated next to the tank-platoon leader. This scheme of maneuver will be most beneficial in situations when the enemy is in a hasty and/or unprepared defense.

Variant 2. During an offensive in special conditions (urban terrain, mountains, forest, desert, etc.), it is important to prevent the enemy from suddenly flanking attacking battalion and the seams between companies. Therefore the combat formation of the companies (platoons) will be oblique from right/left, and a robust reconnaissance will be conducted in the directions from which the enemy could possibly approach. The second echelon (reserve) will maintain constant readiness to thwart any potential enemy attack. In this scheme of maneuver, BMPTs are placed on the flanks of the attacking tank companies, with the position of the platoons oblique from left to right (or right to left).

Variant 3. In situations where the enemy has a prepared defense with dense antitank fires and engineer obstacles, a breakthrough zone must be established. The battalion commander (if not the higher commander) will determine the direction for this concentration of effort. In this scheme of maneuver, the BMPTs are placed on the direction of concentrated effort.

Variant 4. For the successful development of an offensive, the timely introduction of the second echelon

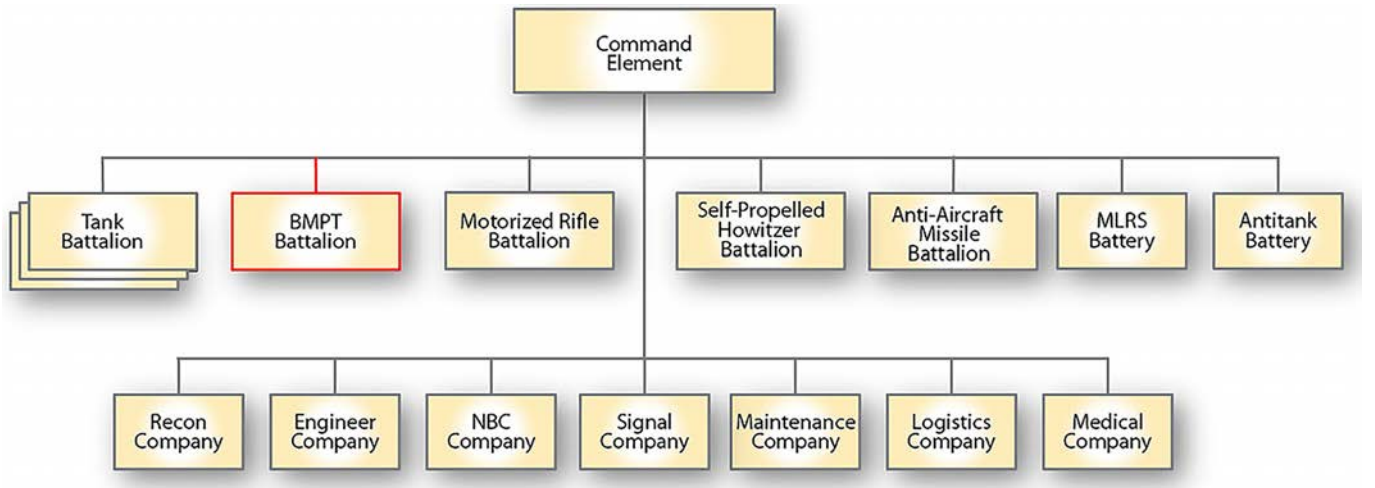

Figure 5. Tank regiment (with BMPT battalion). *(U.S. Army graphic by Dr. Charles K. Bartles)*

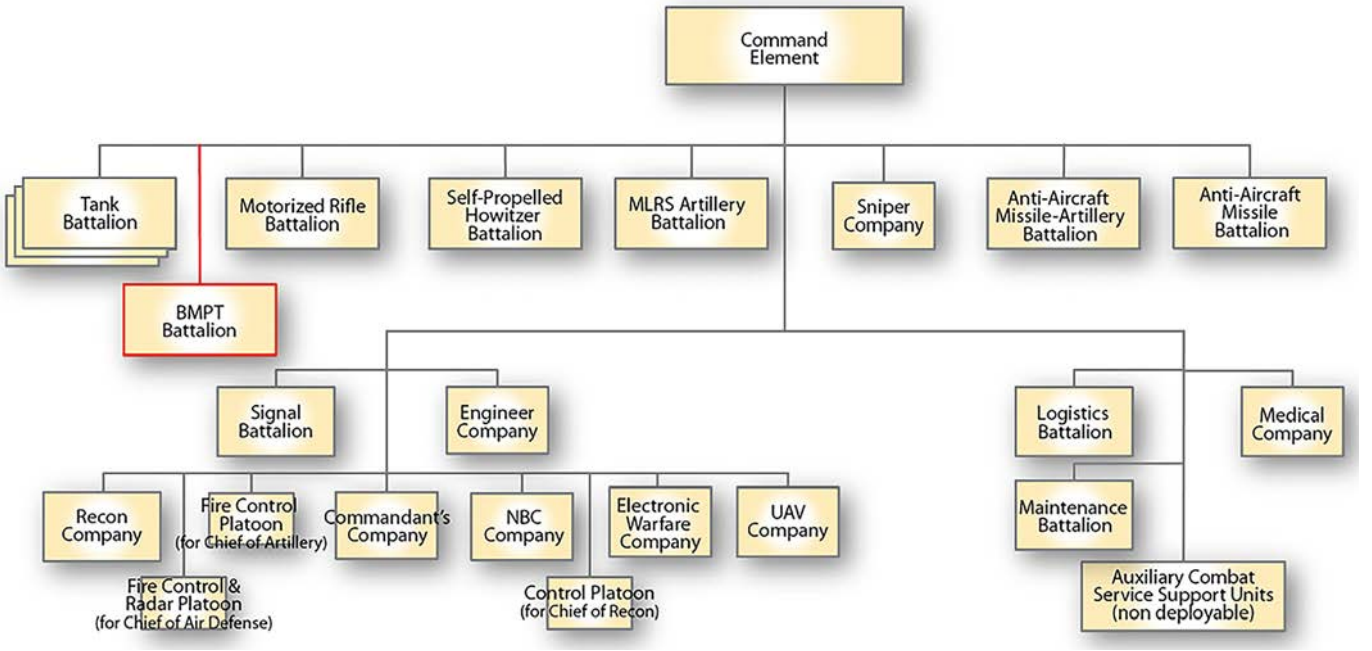

Figure 6. Tank brigade (with BMPT battalion). *(U.S. Army graphic by Dr. Charles K. Bartles)*

(combined-arms reserve) into battle is important. When the second echelon of the battalion is introduced into battle, it is advisable to place the BMPT on its flanks to provide covering fires for the tank company conducting the assault and to protect it from possible enemy counterattacks.

If the second echelon is committed to combat, one of the tank companies of the first echelon is withdrawn from combat. Then the BMPTs supporting it can be retasked to support the new tank company being introduced to battle.

In any case, the placement of the BMPTs in the combat formation of the battalion is determined by the battalion commander. In some cases, the battalion commander may not attach the BMPTs to the first-echelon companies but instead leave them in his reserve to deal with unforeseen

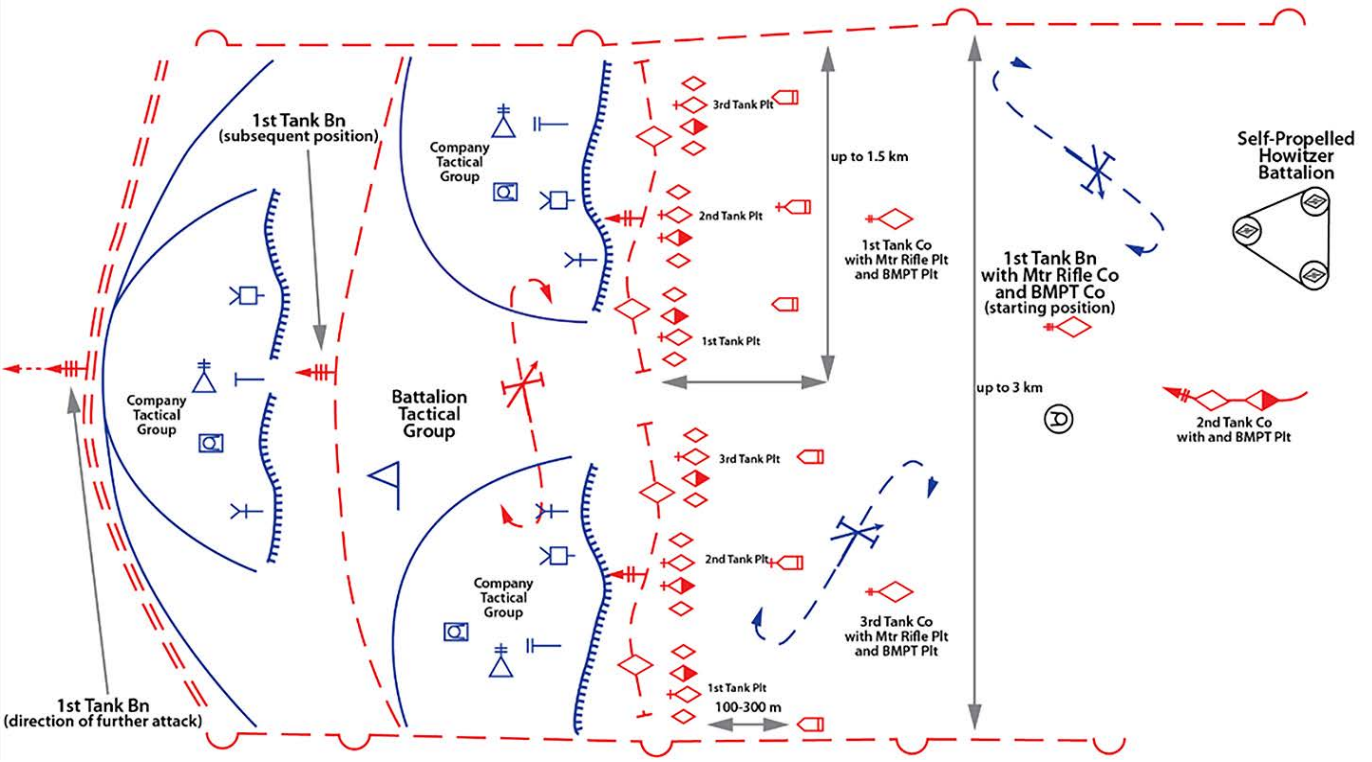

Figure 7. Combat formation of tank companies each reinforced with motorized rifle platoon and BMPT platoon. The platoons are positioned in line (BMPTs are placed evenly between the tanks). *(U.S. Army graphic by Dr. Charles K. Bartles)*

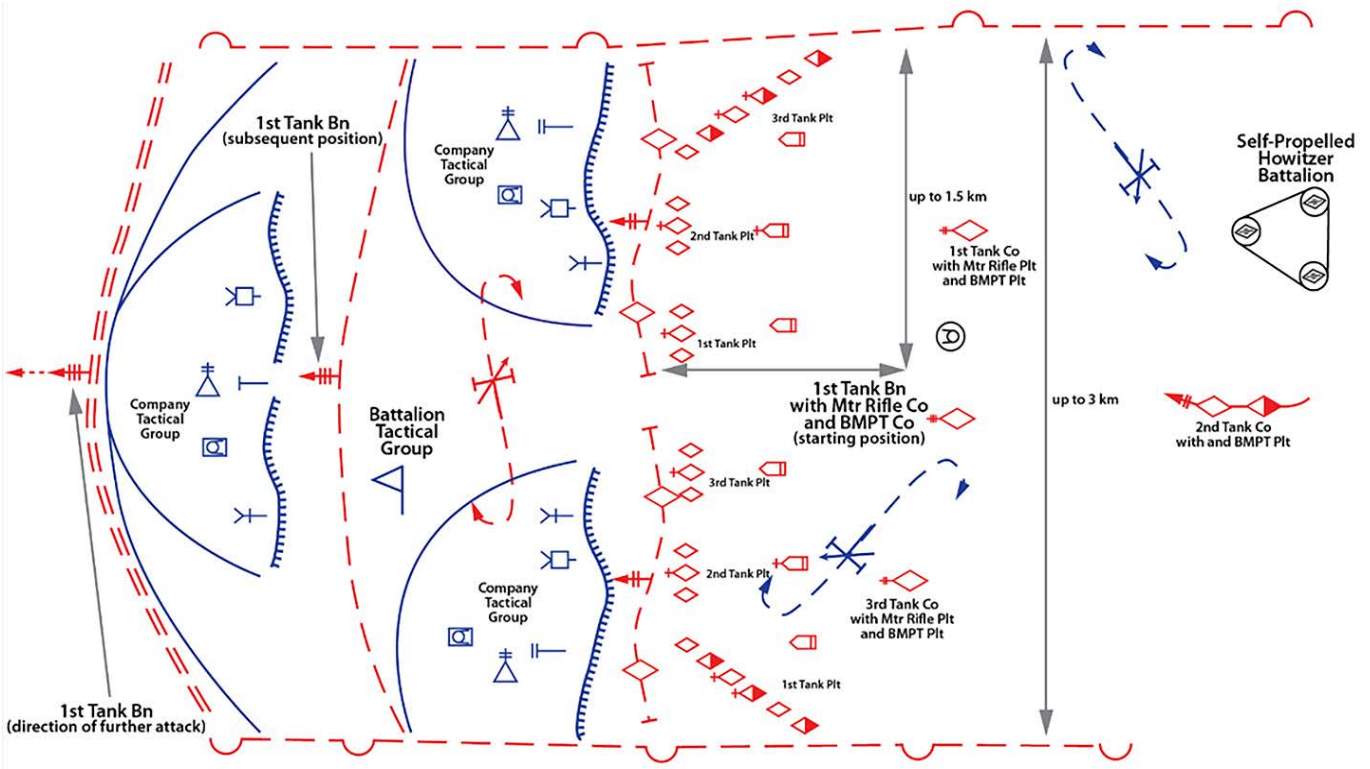

Figure 8. Combat formation of tank companies, each reinforced with motorized rifle platoon and BMPT platoon. The BMPT platoons are positioned oblique from right/left. *(U.S. Army graphic by Dr. Charles K. Bartles)*

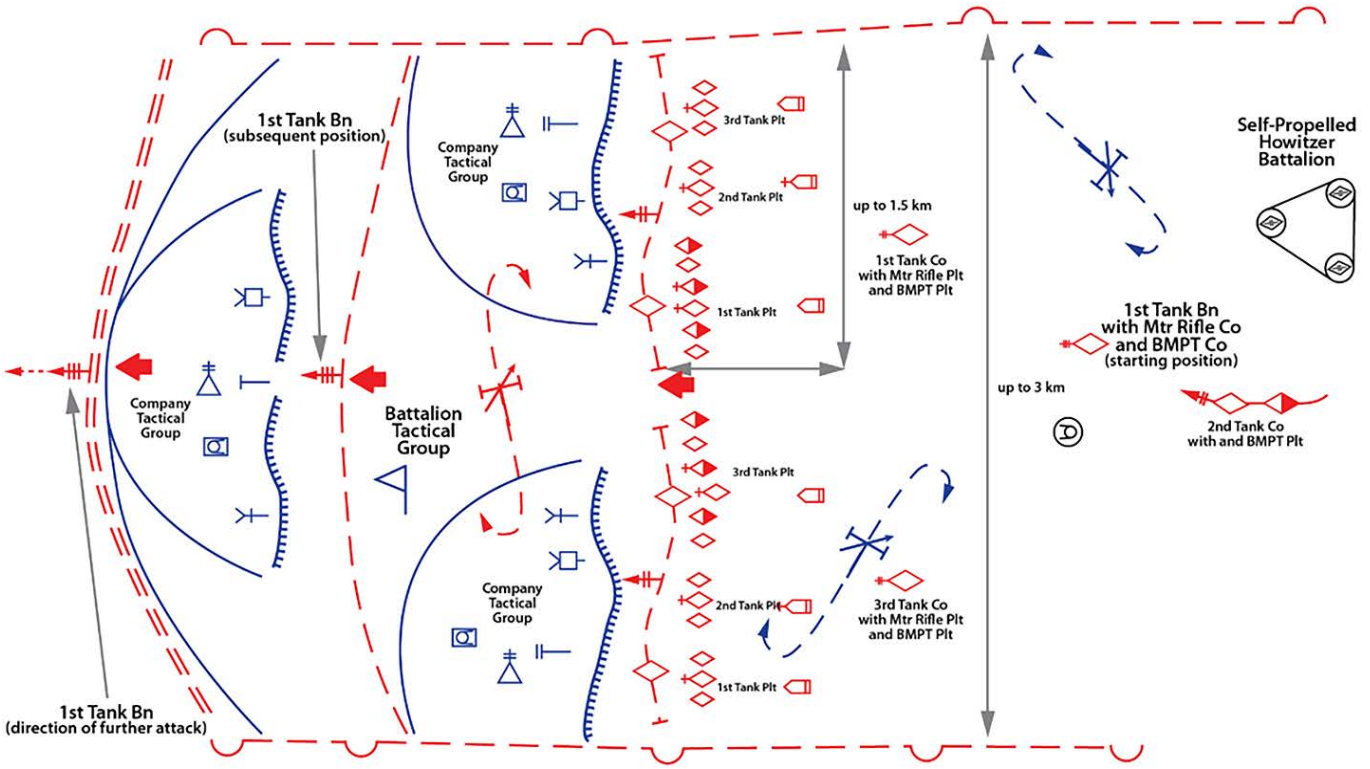

Figure 9. Combat formation of tank companies, each reinforced with motorized rifle platoon and BMPT platoon. The position of the platoons is in line (BMPTs are placed on the direction of concentration of the main effort). *(U.S. Army graphic by Dr. Charles K. Bartles)*

contingencies. This is done primarily to repel possible enemy counterattacks. These BMPTs will move with the second echelon of the battalion to either reinforce the second echelon as it enters battle or else perform some other combat mission.

Based on Russian's initially heavy tank losses in Ukraine, many in the West

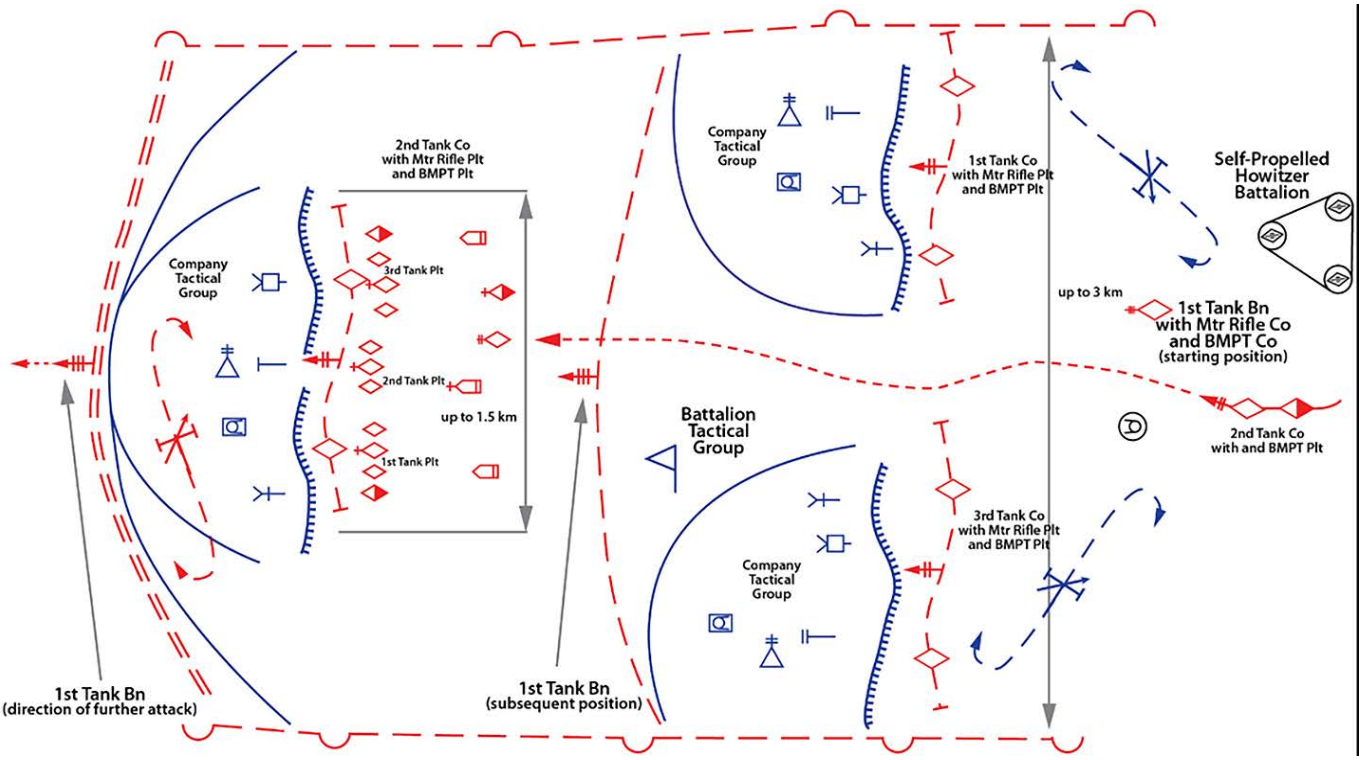

Figure 10. BMPT platoon in the second echelon (BMPTs on company flanks). *(U.S. Army graphic by Dr. Charles K. Bartles)*

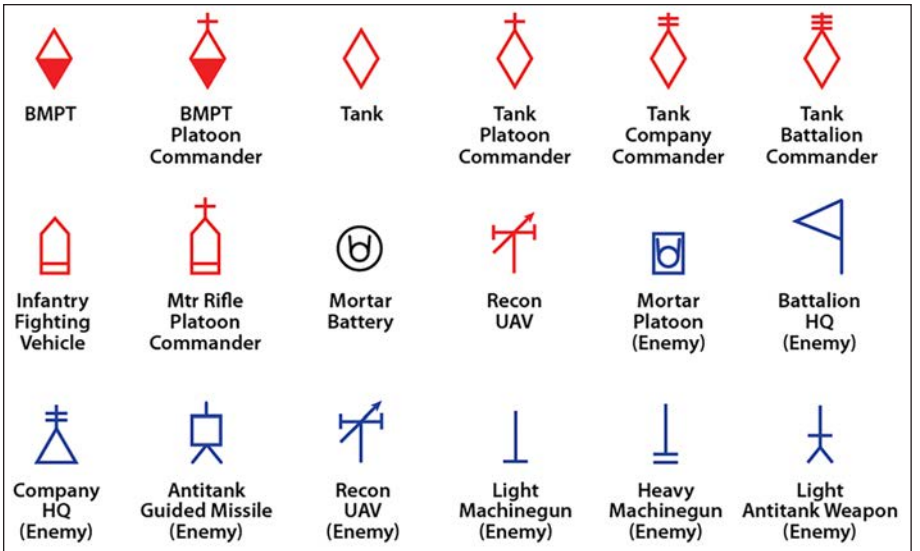

Figure 11. Legend of Russian symbols for Figures 7-10. *(U.S. Army graphic by Dr. Charles K. Bartles)*

have concluded that the tank is obsolete. Later combat in Ukraine showed that tanks are still a vital and decisive weapons system that play a critical role in modern combat.[12] However, it is also clear that tanks need immediate support against air and ATGM attack.

It is apparent that Russian military theorists have concluded that the BMPT concept is viable and merits further development based on the system's combat experience in Syria and Ukraine. But Russian military theorists seem convinced that BMPTs will significantly increase the combat capabilities of a tank battalion, especially in urban areas where tanks have traditionally had difficulties. BMPTs can reportedly ensure the completion of combat missions in a shorter time and to a greater depth/width than tank formations acting without BMPT support.

The BMPT has been under consideration and development since the days when the Soviet Army and Warsaw Pact confronted NATO. The BMPT was designed not only for urban areas but also for the large, open areas of Russia where a noncontiguous (fragmented) battlefield with open flanks would be the norm, and maneuver and firepower would dominate the fight.

The "special military operation" in Ukraine is not that battlefield. The Ukrainian forces outnumber the Russians, the lines are contiguous, and firepower has a decided edge over maneuver. Two artillery armies with a common history, geography and way of war are battling for a decision that is anything but quick. The BMPT has arrived late to the fight and in small numbers.

Some lessons appear to be developing from that conflict. Reliable reconnaissance, communications and precision fires are crucial. Towed artillery appears to be a thing of the past. System support and maintenance need a lot of work. Firepower enables maneuver, but firepower is not strictly the

provenance of the artillery. The BMPT provides a tank unit with significant firepower in conjunction with the artillery and enhanced mounted infantry. The BMPT will probably be a larger component of Russian tank units following the current conflict.

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Notes

[1] M. Yurshin, A. Hazarenko and A. Chogovadze,"Тесное Сопровождение [Close Support]," ***Armeisky Sbornik***, September 2022.

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[6] Sergey Ptichkin, "ВС РФ впервые применили в ходе спецоперации БМПТ 'Терминатор' [The armed forces of the Russian Federation used the BMPT 'Terminator' for the first time during the special operation]," ***Rossiyskaya Gazeta***, the official newspaper of the Russian Federation published by the Russian government, May 18, 2022, https://rg.ru/2022/05/18/vs-rf-vpervye-primenili-v-hode-specoperacii-bmpt-terminator.html.

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[8] "Источник: 'Терминаторы' показали высокую боевую устойчивость на Украине [Source: 'Terminators' showed high combat effectiveness in Ukraine]," ***RIA Novosti***, July 22, 2022, https://ria.ru/20220722/terminatory-1804166241.html.

[9] "Российские 'Терминаторы' выдерживают попадание 'Джавелина', заявил источник [Russian Terminators can withstand Javelin hit, sources say]," ***RIA Novosti***, Aug. 31, 2022, https://ria.ru/20220831/bmpt-1813306805.html.

[10] Since the BMPT has about the same amount of firepower as two motorized rifle platoons and there is interest in having the system support dismounted infantry, there has been some discussion of rebranding the system as a "fire-support combat vehicle," but as of now the name of record for the system is still "tank-support combat vehicle."

[11] M. Yurshin, A. Hazarenko and A. Chogovadze,"Тесное Сопровождение [Close Support]."

[12] Jeff Shogol, "Tank warfare is still relevant, even if the Russians suck at it – Russia's horrific tank losses in Ukraine are not the death knell of tank warfare," ***Task and Purpose***, Sept. 23, 2022, https://taskandpurpose.com/news/tank-warfare-Russia-Ukraine-future/?utm_source=sailthru&utm_medium=email&utm_campaign=mil-ebb.

Acronym Quick-Scan

ATGM – anti-tank guided missile
BMP – *boyeva mashina pekhoty* (Russian infantry fighting vehicle)
BMPT – *boyevaya mashina podderzhki tankov* (Russian tank-support combat vehicle, nicknamed "Terminator")
BTR – *bronetransportyor* (Russian armored personnel carrier)
FMSO – Foreign Military Studies Office
NATO – North Atlantic Treaty Organization
NLAW – Next-Generation Light Anti-Tank Weapon

Expanding Role of Mobile Protected Firepower for Army 2030

by LTC (Retired) Lee F. Kitchen and MAJ Aram M. Hatfield

The U.S. Army awarded General Dynamics Land Systems a low-rate initial-production contract June 28, 2022, to produce 96 mobile protected firepower (MPF) vehicles capable of providing infantry brigade combat teams (IBCT) with "greater survivability, the ability to identify threats early and at greater distance … allowing Soldiers to move at a faster pace."[1] The MPF's shock, mobility and firepower will provide the light-infantry division the ability to fight and win in multidomain large-scale combat operations. However, this use case is decidedly narrow in scope.

The MPF's expeditionary characteristics make it viable in operations where heavier vehicles cannot be employed. The MPF can serve in a wider variety of roles across the land domain beyond its planned purpose as an infantry-support weapon in the light-infantry division. Expanding the role of the MPF in both light and armor-centric divisions and corps can greatly increase the mobility and firepower of the Army's largest tactical formations.

The MPF is the Army's first new tank since fielding the M1 Abrams main battle tank (MBT) in 1980. The M551 Armored Reconnaissance/Airborne Assault Vehicle, "General Sheridan," which entered service in 1966, was the Army's last light tank. Although the Sheridan possessed the attributes of a light tank – such as thinner armor and less weight than the MBT, and greater strategic and tactical mobility than a heavier tank – the Army refused to call the M551 a light tank. Similarly, calling the MPF something other than a tank "is intended to dissuade service members from viewing it as a tank-like vehicle and then employing in the same way as the M1."[2]

Certainly, the lighter weight and protection of the MPF vehicle necessitates that it be employed differently than the better-protected M1. This does not mean that the system must be relegated to the duties of an assault gun. Commanders should consider the possibility of collectively employing the MPF to exploit opportunities and achieve objectives through overwhelming shock and firepower.

Restating requirement for light tank

Since the M551's retirement, light formations resorted to using uparmored humvees with a variety of weapons as a replacement for the M551. Near-peer adversaries during the same period continued to field strategically and tactically deployable light armored fighting vehicles far more lethal and survivable than uparmored humvees. Recognizing the need for more substantial armor support to infantry, the XVIII Airborne Corps has frequently requested mechanized company-teams to support IBCTs during Joint Readiness Training Center (JRTC) rotations and for future contingency operations.[3]

MG John W. Nicholson Jr., commanding 82nd Airborne Division, voiced the need for a platform that would provide the division with capabilities like

Figure 1. M551 Sheridans of Troop E, 17th Cavalry, 101st Airborne Division, at Fort Campbell, KY, in April 1972. *(U.S. Army photo)*

Figure 2. M8 Armored Gun System (AGS) Level 2 armor, circa 1994. *(U.S. Army photo)*

Figure 3. The MPF ground-combat vehicle from General Dynamics Land Systems. *(U.S. Army photo)*

those of M551. "Having [MPF] that can be delivered either by air-drop or air-land enables us to retain the initiative we gain by dropping in," MG Nicholson said. "But if all we are doing is jumping in and then moving at the speed of World War II paratroopers, we are going to rapidly lose the initiative we gained by conducting strategic or operational joint forcible entry."[4]

The MPF has since evolved from an idea to a platform capable of "neutralizing enemy prepared positions and bunkers and defeating heavy machineguns and armored vehicle threats during offensive operations or when conducting a defensive operation against attacking enemies."[5]

While the MPF provides substantial firepower to the IBCT, the Russo-Ukrainian war raises significant questions about the survivability of armor in modern war. Ukrainian troops have been extremely effective at destroying Russian vehicles with man-portable anti-tank guided missiles (ATGMs). Without an active countermeasure system, armored vehicles remain highly vulnerable to ATGMs and other projectiles. Considering the reality that dismounted infantry and indirect fires cannot completely defeat enemy anti-armor threats, the final production design of the MPF will be capable of mounting the Trophy Active Protection System.[6]

MPF in division

The planned organization for MPF, according to the Army 2030 divisional realignment, provides each light division with an armor battalion consisting of three MPF companies, a forward-support company and a headquarters and headquarters company. Since the primary purpose of the MPF battalion is to support infantry brigades and battalions by detaching MPF companies and platoons to them, the battalion headquarters will lack the full staffing required to conduct battalion-level tactical operations. Instead, the battalion's primary function is to provide training, administrative and sustainment support to the companies as they support the infantry.[7]

The inherent versatility of the MPF allows a wider variety-of-use cases and force-structure models that can provide division commanders with a greater set of options. In World War II, the Army pooled separate tank battalions at the corps or field-army levels for piecemeal attachment to an infantry division, regiment or battalion deemed in need of armor support. The separate tank battalion retained the capability to fight, in its organic organization, as part of a larger task force or in support of a division or corps.[8]

The Army of 2030 should retain this capability for flexible employment by making the MPF battalion a warfighting formation capable of conducting battalion-level operations in support of division objectives. Organizing the MPF battalion as a non-tactical formation prevents the division commander from fully exploiting the range of the MPF's capabilities. For example, a tactical MPF headquarters could mass its battalion in a counterattack during a division defense, bringing its overwhelming shock and firepower to bear on an unsuspecting enemy. Without a tactical battalion headquarters to command and control the division's MPF, commanders may have to settle for local counterattacks by MPF companies in each brigade's sector.

It is understandable that the Army must make hard choices in an environment of fiscal and personnel constraints, but a resource decision should not diminish the capabilities of a weapon system. Division commanders who intend to employ the MPF battalion as a tactical headquarters should man it as such by moving the appropriate staff and personnel to the battalion from across the division. While this induces risk in other tactical battalions by removing manpower, the result is a tactical armor battalion capable of massing an extraordinary amount of the division's combat power at a decisive point.

Many organizational structures are viable if the Army designs the divisional MPF battalion as a tactical headquarters. The Army published doctrine for such an organization in 1994 in preparation for the fielding of the M8 AGS, which it eventually canceled. Field Manual (FM) 17-18, ***Light Armor Operations***, since rescinded, states that the divisional M8 AGS battalion could fight as a maneuver force when the enemy has a considerable mechanized or armored force; terrain favors the use of it as a maneuver force; or a contingency mission has matured to the level that the entire division has deployed. A modern interpretation of this concept is a task-organized provisional combined-arms battalion-light (CAB-L).

One possible organization for the CAB-L (Figure 4) would add a rifle company to the MPF battalion to provide local security and counter anti-tank threats. The rifle company would be equipped with infantry-squad vehicles to maintain pace with the MPF. Depending on the mission variables, the CAB-L would accept other enablers to aid in mission accomplishment. In this configuration, the division commander can employ the CAB-L to provide more firepower

to the main effort or to use the CAB-L's mobility and shock action for penetration or exploitation operations.[9]

MPF in combined joint forcible-entry amphibious operations

Defending his service's decision to eliminate its tank battalions, Marine Corps Commandant GEN David Berger said, "We need an Army with lots of tanks … We don't need a Marine Corps with tanks." The Marine Corps' decision to divest its tanks created a natural role for the MPF in amphibious joint forcible-entry operations, a mission not previously considered when designing the MPF.[10] The Abrams' strategic-deployment limitations, size and heavy sustainment requirements complicate its employment in amphibious operations. The MPF provides advantages over legacy armor in the Indo-Pacific's dense jungle environment, numerous islands and unimproved roads, not to mention its potential employability on existing amphibious-landing craft.

Bearing in mind that the latest iteration of FM 3-0, ***Operations,*** includes a chapter on Army operations in maritime environments, MPF-equipped light divisions that are regionally aligned to the Indo-Pacific region should consider their contribution to amphibious operations. One example is employing a variation of the CAB-L concept to rapidly expand a Marine Corps-established beachhead while the joint force continues to build combat power. The MPF is a natural fit to fill the armor gap left by the Marine Corps, and it possesses further utility outside of the light division as well.

MPF in future armor-centric divisions

Beyond its planned employment in light-infantry divisions, the MPF's mobility and firepower make it a viable replacement for the M1 tank in cavalry formations of the future armor-centric divisions. Its lighter weight gives it greater agility and mobility than the Abrams, allowing it increased maneuverability in restricted and urban terrain. The MPF's weight reduces the road and bridge limitations on the

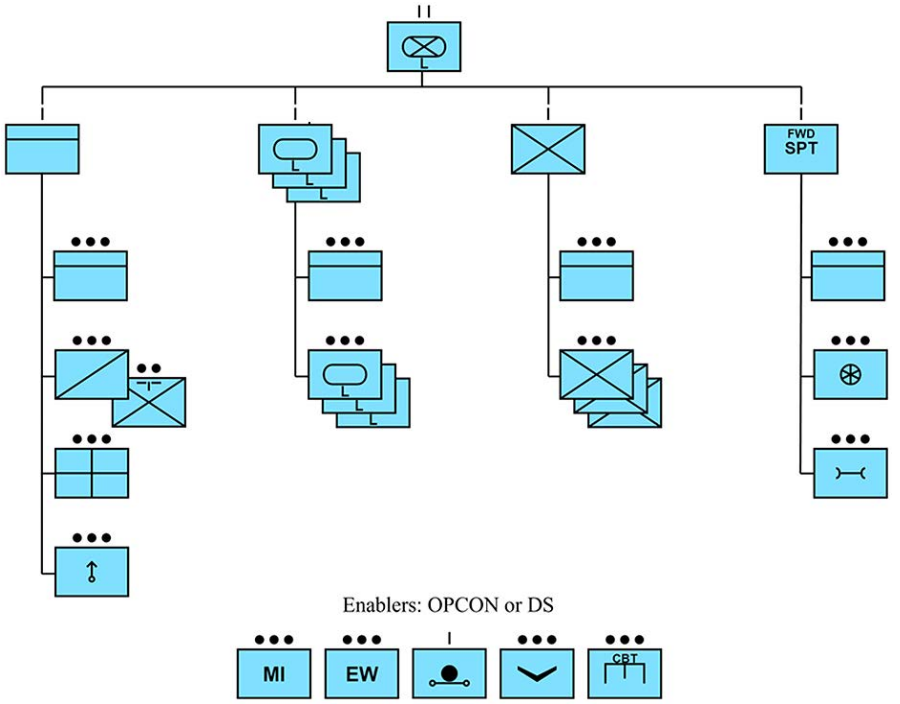

Figure 4. CAB-L organization.

North Atlantic Treaty Organization's eastern flank that otherwise provide mobility challenges to armor-centric formations, and it offers advantages in the Indo-Pacific as previously stated. Employing the MPF in a heavy cavalry formation does introduce tradeoffs; its reduced firepower and lighter armor may diminish its ability to fight for information. However, its greater strategic and tactical mobility and greater agility are reasonable offsets to the relative reductions in firepower and protection.

Commanders must also consider the operational environment's restrictions on their own heavy armor will also affect the enemy's ability to introduce tanks; employing the MPF in these scenarios may provide U.S. forces with a significant advantage over an underequipped adversary. When teamed with the Bradley Fighting Vehicle or its future replacement, the MPF provides the commander with a well-rounded reconnaissance formation capable of performing high-tempo cavalry operations in the Army's current regions of focus.

Corps armored-cavalry regiment-light

In addition to its practicality in both light and armor-centric divisions, the MPF can provide the Army's light corps with the basis for a potent reconnaissance and security (R&S) formation. While the division's focus is tactical maneuver, the focus of the corps is shaping conditions and circumstances through its enablers and organic assets to ensure the success of its assigned divisions.[11] Essential to the success of a corps is a formation that can provide the full range of R&S operations.

Since the conversion of 2nd and 3rd Armored Cavalry Regiments (ACRs) to Stryker brigade combat teams (SBCTs) in 2005 and 2013 respectively, the Army has been without a purpose-built corps-level R&S formation. An MPF-centric ACR that mixes lighter reconnaissance vehicles with the heavier-hitting MPF provides the corps with an R&S formation that possesses the necessary mobility and firepower to fight for information across a broad range of operational environments.

The ACR-light (ACR-L) would consist of three cavalry squadrons consisting of two MPF companies and two cavalry troops. The ACR-L would also include a fires squadron, a sustainment squadron and more enablers from the corps as needed.

Employing light armor in an ACR is not

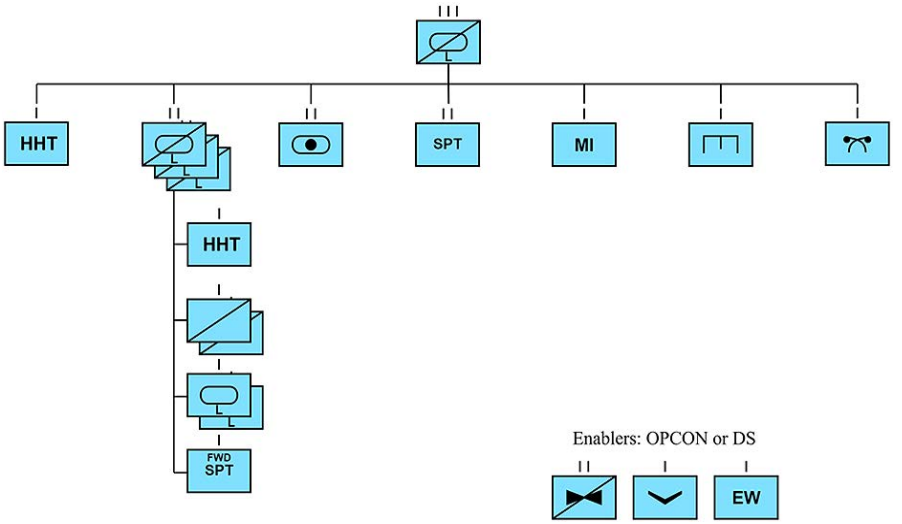

Figure 5. ACR-L organization.

without precedent; before the cancellation of the M8 AGS, the Army planned to field M8s to 2nd ACR, granting the regiment a greater capacity to aggressively fight for information. Given the complexity and the scope of corps-level R&S operations, an *ad hoc*, provisional formation entails unacceptable risk. To mitigate this risk, it must be a table of organization and equipment formation requiring the procurement of additional platforms.

The Army can leverage the MPF to create light ACRs for I Corps, V Corps and XVIII Airborne Corps designed for use in the U.S. European Command and U.S. Info-Pacific Command area of operations or any operational environment that precludes the use of heavier armor. The Army can manage the personnel costs of activating an ACR-L by converting existing SBCTs. I Corps could gain an ACR-L by converting an SBCT from 7th Infantry Division; likewise, an SBCT from 4th Infantry Division could be relocated to Fort Stewart, GA, and converted to an ACR-L for XVIII Airborne Corps.

Finally, V Corps' European mission set necessitates the conversion of 2nd Stryker Cavalry Regiment to an ACR-L. Given its increased mobility, protection and firepower over existing light and medium vehicles, the MPF will provide I, V and XVIII Corps with a significantly more lethal capability that can be employed in an expeditionary manner to locations that considerably restrict the mobility of heavier forces.

DOTMLPF-P considerations

Although this article focuses primarily on the organization of potential future MPF units, there are other elements of doctrine, organization, training, materiel, leadership and education, personnel, facilities and policy (DOTMLPF-P) the authors consider relevant.

Doctrine. While the MPF is intended to primarily serve in an infantry-support role, expanding its use cases necessitates more supporting doctrine. Placing the MPF in a cavalry squadron or regiment means MPF crews and units must be proficient in independent armor operations, fighting for information and close-in support to ground troops. The inherent differences in maneuver, fire control, communication and more among these different missions should be codified in a single manual, providing a sole doctrinal source for both MPF units and the units they support. The blueprint for an all-encompassing MPF manual already exists in FM 17-18, ***Light Armor Operations***.

In addition to updating the manual for multidomain operations, doctrine writers should add a purpose-built chapter on urban operations. The increasing likelihood that U.S. forces will conduct future operations in urban terrain means that MPF crews and units must be prepared to fight in cities. Maneuver leaders must dispel the notion that tanks do not belong in cities. The role of armor in the urban fight nests with the MPF's mission to reduce fortified positions for the infantry; as demonstrated in Fallujah in 2004, a well-trained and well-resourced armor force can have outsized effects while minimizing casualties for the combined-arms team.[12]

A chapter on urban operations should address both the MPF and infantry forces. Topics should include formations of combined infantry-armor teams; the conduct of local security for the MPF; sectors of fire; surface-danger zones; communications; when and how infantry should ride on the MPF; and more. Although MPF units will undoubtedly cover these topics in their own standing operating procedures (SOPs), the doctrine should provide a baseline to ensure that units think about all aspects of infantry-armor operations in urban terrain.

Organization. Sustaining the MPF battalion, regardless of its organization, may prove to be the greatest difficulty for light divisions. The MPF battalion's forward-support company (FSC) will be robust enough to support each MPF company separately across the division's operational environment. The FSC's assets will likely be organized into separate teams that would detach from the battalion along with each MPF company during operations. These teams will contain the necessary transportation, maintenance and recovery assets to keep MPF companies fully-mission-capable during operations, and they will integrate with infantry brigade-support battalions to ensure seamless sustainment.

Leaders must also consider the strain that an MPF battalion places on the division-sustainment brigade and whether the current organization of the sustainment brigade can support the quantities of fuel and ammunition that the MPF will consume. Light divisions must anticipate the massive increase in demand or risk having the MPF battalion culminate early in an operation.

Training. Regardless of how divisions and corps implement MPF, collective training at home stations will take on a new level of importance. Those units who plan to work closely with MPF

must regularly conduct collective field and live-fire training with MPF so that all participants gain knowledge, respect and familiarity with each other, which will prevent accidents and increase effectiveness in combat. Although doctrine will provide a baseline, MPF and supported units should create a living SOP to continually improve interoperability. As a habitual element of Joint-force amphibious operations, MPF formations must also train with Marine Corps landing forces.

Wider employment of the MPF by converting SBCTs to ACR-Ls will surely cause a wider training issue. Converting an infantry-centric brigade to a decidedly more armor-centric regiment will put a burden on the Army to properly reallocate personnel.

The Army can alleviate this problem by creating an additional skill identifier for MPF crewmen in the interim, so that any maneuver Soldier can be certified on the platform while the U.S. Army Armor School works to generate the required number of MPF crewmen. By adding an MPF leader's course for officers and noncommissioned officers, mobile training teams can certify existing Soldiers on the platform without undergoing massive personnel movements.

Materiel. The light division's ability to perform MPF recovery operations is a major concern. Current wheeled recovery systems are incapable of lifting or towing a 38-ton tracked vehicle, leaving the M88A2 Hercules tracked recovery vehicle as the only option. As it stands, the M88A2 is overqualified for the job given its original purpose of recovering the M1 Abrams, which now stands at more than 70 tons.

Of course, the M88A2 must also be able to be recovered, necessitating at least two of the vehicles at any light division. An ideal solution would be to manufacture a light armored recovery vehicle on the MPF chassis, allowing better interoperability between recovery and MPF vehicles. However, since the vehicle would have to be manufactured in low numbers, this solution is extremely costly. If the Army were to employ the MPF in greater numbers across the force as this article envisions, the cost of manufacturing this solution would correspondingly diminish.

A second materiel acquisition that would enhance the MPF platform is a mine plow and mine roller for conducting the combined-arms breach. This would greatly increase the speed and safety with which light engineers are able to reduce obstacles, and it would allow MPF units to conduct in-stride breaches of simpler obstacles. However, mine plow and roller transport requirements may prevent them from being brought forward on expeditionary deployments. Like the recovery vehicle, these systems would be costly to manufacture in relatively low numbers and would equally become more cost-efficient with greater employment of MPF across the force. Ultimately, the need (or lack thereof) for these materiel solutions will be realized during MPF training and employment, at which point these decisions can be re-evaluated.

Bridging assets for the MPF-equipped light division or ACRs are also worthy of consideration. The current Rapidly Emplaced Bridge System (REBS) can support tracked vehicles weighing up to 40 tons, and wheeled vehicles up to 50 tons. The current stated weight of the MPF at 38 tons means that a combat-loaded and equipped MPF could very easily exceed the REBS' 40-ton tracked vehicle capacity. Any supplements to the MPF, like more armor or an attached mine plow, would similarly create risk in bridging operations.

Adding more capacity to the REBS may soon be necessary to ensure proper gap-crossing ability for MPF units. In the meantime, MPF operators and maneuver planners should remain aware of this issue.

Leadership and education. The first MPF company is not expected to be fielded until mid-2025.[13] However, leaders in every warfighting function must consider how MPF will be employed and how they will support or integrate the vehicle into their operations. The Army's professional military education should begin to integrate MPF into training prior to 2025 by updating decisive-action training environment scenarios to incorporate MPF. At a minimum, these changes should occur in the maneuver basic officer leader courses, the Maneuver Captain's Career Course (MCCC) and the Command and General Staff College (CGSC).

Division and corps warfighter simulations should also include MPF to provide staffs with a heightened level of familiarity. The publication of MPF doctrine prior to 2025 will also give leaders the chance to conduct professional development with their subordinates, building capability and readiness before engaging in training.

Facilities. The ability of divisions and corps to build and train cohesive teams around the MPF will rely considerably on their available training facilities. If the best interoperability training occurs during collective field and live-fire training, MPF-equipped units require the necessary maneuver areas, live-fire ranges and maintenance facilities to do so. Since posts housing light divisions generally lack these facilities, leaders may have to accept compromises. If the cost of building suitable range complexes is too expensive, MPF units at locations like Fort Bragg, NC, Fort Campbell, KY, or Joint Base Lewis-McChord, WA, may be forced to conduct regular travel to a suitable nearby post for live-fire training – Fort Knox, KY, Fort Pickett, VA, and Fort Stewart, GA, come to readily to mind. In other locations, a lack of access or proximity to the appropriate facilities at their parent unit's location may cause MPF units to be permanently stationed away from their parent units entirely to achieve the necessary levels of readiness. Both scenarios make collective training with supported or task-organized units difficult. This situation provides an opportunity to regularly practice deployment readiness by traveling to another post, increasing units' preparedness for contingency operations.

Conclusion

In a significant milestone for maneuver forces and after nearly 30 years since the retirement of the M551 Sheridan, the Army will successfully field the MPF to light infantry divisions in 2025. The MPF will provide much-needed mobility, shock and firepower to light divisions; the inherent

versatility of the platform will undoubtedly cause MPF units to take on new missions. In anticipation of this growth, leaders must envision a variety of MPF organizations and missions. The possibility of employing the MPF as a tactical battalion provides the division commander with a separate battalion that can aggressively maneuver and fight across the battlefield, generating an overwhelming shock at the decisive point.

Similarly, the Army's corps can employ MPF as the centerpiece of a light armored cavalry regiment suitable for maneuver across the Indo-Pacific and the European continent, or in contingencies worldwide. The MPF may even prove useful in heavy cavalry formations, favoring mobility and agility vs. the heaver M1. As the ever-increasing weight of other armored platforms limits their mobility and expeditionary deployment, the MPF, limited only by fiscal and manpower constraints, is best suited to provide the Army's light forces with a versatile system capable of a variety of missions.

Retired LTC Lee Kichen served in command and staff positions in armor, armored-cavalry and mechanized-infantry units in the United States and overseas. He also served on the Army Staff and Training and Doctrine Command staff. LTC Kichen's military schooling includes Air War College (non-resident), CGSC, Armor Advanced Officer Course and Armor Officer Basic Course. He holds a bachelor's of arts degree in history from the University of Massachusetts at Amherst, a master's of social-sciences degree in sociology and political science from Pacific Lutheran University and a master's of arts degree in counseling psychology from Chapman College. His awards and honors include the Legion of Merit (one oak-leaf cluster) and Meritorious Service Medal (two oak-leaf clusters) and the Order of St. George- Silver Medallion.

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MAJ Hatfield commanded the Army's MPF Company Excursion at Fort Bragg from 2018 to 2020. Company A, 4th Battalion, 68th Armor (Provisional), used 18 light armored vehicles borrowed from the U.S. Marine Corps to develop tactics, techniques and procedures for the future MPF vehicle. The company took part in many infantry battalion and brigade field-training exercises and successfully supported 1st BCT, 82nd Airborne Division, at JRTC.

Notes

[1] Army Public Affairs release, June 28, 2022.

[2] LTC Ben Ferguson and CPT Lennard Salcedo, "Mobile Protected Firepower: An Opportunity," ***ARMOR***, Summer 2022 edition. The M8, canceled just before the start of protection, was officially the Armored Gun System. However, FM 17-18, ***Light Armor Operations*** (written specifically for employment by light-armor battalions, companies and platoons), referred to it as a light tank.

[3] Ferguson and Salcedo.

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[6] Eric Tegler, "Two Light Tank Prototypes Battle for the Future of Army Firepower," ***Popular Mechanics***, March 7, 2021, https://www.popularmechanics.com/military/weapons/a35634134/army-mpf-tank/.

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[8] Anthony Daskevich II, ***Insights Into Modularity: 753rd Tank Battalion In World War II***, Carlisle, PA: U.S. Army War College, March 15, 2018.

[9] Headquarters Department of the Army, FM 17-18, ***Light Armor Operations*** (rescinded) May 8, 1994.

[0] Michael R. Gordon, "Marines Plan to Retool to Meet China Threat," ***Wall Street Journal***, March 22, 2020; quoted in Matthew W. Graham, "Tanks in the Surf: Maintaining the Joint Combined Arms Landing Team," land-warfare paper, Washington, DC: Association of the U.S. Army, July 2022.

[11] Headquarters DA, FM 3-94, ***Theatre Army, Corps and Division***, July 21, 2021.

[12] Kendall D. Gott, ***Breaking the Mold: Tanks in the Cities***, Fort Leavenworth, KS: Combat Studies Institute Press, 2006.

[13] Stone briefing, Maneuver Warfighter Conference Feb. 16, 2020, Fort Benning.

Acronym Quick-Scan

ACR – armored-cavalry regiment
ACR-L – armored-cavalry regiment-light
AGS – Armored Gun System
ATGM – anti-tank guided missile
BCT – brigade combat team
CAB-L – combined-arms battalion-light
CGSC – Command and General Staff College
DOTMLPF-P – doctrine, organization, training, materiel, leadership and education, personnel, facilities and policy
FM – field manual
FSC – forward-support company
IBCT – infantry brigade combat team
JRTC – Joint Readiness Training Center
MBT – main battle tank
MCCC – Maneuver Captain's Career Course
MPF – mobile protected firepower
R&S – reconnaissance and security
REBS – Rapidly Emplaced Bridge System
SBCT – Stryker brigade combat team
SOP – standing operating procedure

Combat Vehicle Developments to Propel Army of 2030 – and Beyond

by Dan Heaton

Protection from above, an adaptability for future technology and a reduced logistical footprint are among the transformational capabilities of the new armored vehicles in development for the Army's divisions and armored brigade combat teams (ABCTs).

As the Army moves toward 2030, its 16 ABCTs (11 in the active-duty force and five in the National Guard) are undergoing a once-in-a generation transformation to bring new capabilities to leaders and Soldiers. The ABCTs of 2030 require new and different capabilities to defeat potential adversaries on future battlefields that will use advanced equipment and cutting-edge technologies in the 21st Century. To counter these future threats from peer adversaries, the Army Future Command's Next-Generation Combat Vehicles Cross-Functional Team (NGCV CFT) works with both internal and external partners to develop faster, more survivable and more capable armored vehicles, able to deliver increased firepower to the battlefield.

Transforming the capabilities of ABCT is a team sport. The next generation of combat vehicles is being developed with a partnership that stretches across the Army and beyond:

- The Maneuver Center of Excellence is the Army's centralized planner, manager and integrator for capability development and user activities for Army combat formations.
- NGCV CFT is responsible for developing sound requirements for the highest-priority capabilities, supported by Soldier feedback, to close capability gaps.
- The Maneuver Capabilities Development and Integration Directorate is responsible for determining and developing future-force capabilities for the infantry and armored force of tomorrow and for conducting capability-based doctrine, organization, training, materiel, leadership development, personnel, facilities and policies assessments, experiments and integration.
- The Ground-Combat Systems Center conducts the foundational research and prototyping required for potential new systems.
- Program Executive Office-Ground Combat Systems acquires the vehicles.

Together, this team – with support from industry and academia – are moving deliberately to deliver cutting-edge capabilities to Soldiers.

To achieve maximum effect, armored and combat vehicles must be able to operate in a formation capable of working with our sister services, allies and partners. Individual platforms must have robust, interoperable communications data links both to other platforms in the formation and to higher-echelon commanders. Real-time communications will allow division-level-and-above leaders to see and understand the big picture and rapidly allocate and employ assets to attack an enemy across all domains, while commanders at the brigade level and below focus on the close fight. Developments underway now in the Army's next generation of combat vehicles will ensure our formations retain overmatch into 2030 and beyond.

The U.S. Army is now delivering its first new tracked armored vehicles in 40 years. In January 2023, the first Armored Multi-Purpose Vehicles (AMPVs) will arrive at 1st ABCT, 3rd Infantry Division, at Fort Stewart, GA, in what will be the first of a steady stream of AMPV deliveries to ABCTs. Development of Optionally Manned Fighting Vehicles (OMFVs) continues to proceed, with manufacture of prototype vehicles starting in 2023. Experimentation on concepts that will inform future decisions on upgrades to the Abrams tank will continue in 2023, supporting development efforts that could eventually lead to the Next-Generation Main Battle Tank (NGMBT).

While AMPV, OMFV and tank research are all at different stages of development, they share key commonalities: digital design and open systems architectures. OMFV and future tank developments will feature the Ground-Combat Systems' Common Infrastructure Architecture (GCIA), which is also known as Modular Open-System Architecture (MOSA).

The GCIA approach is central to current OMFV design efforts. Simply put, GCIA allows the Army to incorporate today's technology into a vehicle, while its operating system is intentionally designed in such a way that future technology can still be easily incorporated. GCIA also allows future technology from Company X to be incorporated into a vehicle designed by Company Y because of the "open" nature of the underlying system. AMPV is being fielded with a MOSA-compliant system.

"On OMFV, our industry partners are looking at different armor-package considerations, different track configurations, what systems will we be using for targeting and active protection systems [APSs]," said BG Geoffrey A. Norman, director of NGCV CFT. "The science is continuing on all these fronts, and we don't know for certain which technologies will be ready next. But we will have the architecture in place where we can add those technologies when they have reached the appropriate level of maturity."

While science and technology developments are happening in industry and in government labs and test centers, the Army is also closely watching how armored vehicles are being employed in the most recent Russian invasion of Ukraine in 2022, as well as how they were used in the Nagorno-Karabah conflict of 2020. In both of those conflicts, losses of tanks and other armored vehicles largely appear to stem from lack of combined-arms tactics, compromised logistics, delayed and neglected maintenance,

poor training and even morale issues. Where armor has been properly maintained and employed as part of a mobile combined-arms operation, tanks and other combat vehicles proved their operational value on the battlefield**.**

In a change from 20th Century vehicle-design philosophies, vulnerabilities from unmanned aerial systems or more conventional weapon systems require new approaches. Future U.S. vehicles are therefore being developed with 360-degree defense systems as part of the original design.

Logistics-chain issues are being addressed through several avenues. AMPV was designed on a significantly upgraded chassis of a Bradley Fighting Vehicle (BFV), which provides a level of mechanical commonality to vehicles already existing in the formation. Perhaps most exciting is the development of efficient and reliable hybrid diesel-electric engines to power future vehicles. OMFV is being designed with a requirement that under most tactical-use cases, it would need to be refueled no more than once per day.

Further, OMFV will be able to operate on silent watch and to move for short distances in a silent mode. Increasingly, hybrid engines are viewed as the means to achieve these increased reliability and reduced logistics demands. This will not only significantly decrease the logistical tail needed to support the ABCT but will greatly add to the agility and adaptability OMFV will bring to the armored division.

AMPV

"Tough beats fancy," BG Norman said. "And AMPV is not fancy. It is simply a tough vehicle that is going to bring a level of reliability and durability that our modern formations demand."

AMPV will replace the aging M113 family of vehicles, which first entered active service in 1959. The Army is forecast to eventually purchase more than 2,800 AMPVs. AMPV will be delivered in five variants: general purpose, mortar carrier, medical evacuation, medical treatment and mission-command vehicles. AMPV will fulfill the Army's strategy requirements of protection, mobility, reliability and interoperability.

Perhaps the most significant attribute that AMPV brings to the fight is its ability to keep pace with the Abrams and Bradley, allowing the formation to maneuver more quickly and operate in a more dispersed manner.

OMFV

To defeat our adversaries on the modern battlefield, the Army of 2030 requires new, advanced combat platforms that are not merely updates of vehicles designed in the 1970s. While OMFV will replace the BFV in the ABCT, the OMFV is not merely an updated Bradley. Rather, OMFV will be a transformational infantry fighting vehicle, incorporating new technologies

Figure 1. The AMPV has undergone extensive testing at all three of U.S. Army Yuma Proving Ground's natural environment test centers: Yuma Test Center outside Yuma, AZ; Cold Regions Test Center at Fort Greely, AK; and most recently at Tropic Regions Test Center in the jungle of Panama. *(U.S. Army photo)*

Figure 2. A multi-month evaluation at U.S. Army Cold Regions Test Center helped ensure the Army's latest armored personnel carrier works even in the world's coldest environments. The AMPV boasts the same powertrain and suspension system as the BFV and M109A7 self-propelled howitzer, which eases maintenance and logistics challenges for all three vehicles in the field. *(U.S. Army photo by Sebastian Saarloos)*

and all the Army has learned about mechanized-infantry effectiveness since the Bradley was first fielded in 1981.

Put simply, the OMFV will be more lethal and more survivable, and will feature capabilities that were barely imagined during the Cold War-era design of its predecessor.

The OMFV development process recently concluded a digital design phase in which five companies created virtual prototypes of what the Army's next infantry fighting vehicle might look like. A competition in which up to three companies will be selected to create actual prototypes is now underway, with industry partners to be selected in April 2023. To meet silent-watch and fuel-performance requirements in the digital prototype phase, all five of the Army's industry partners proposed the use of a hybrid-electric engine, and some proposed using composite rubber tracks rather than traditional steel track.

While it remains to be seen if a hybrid-electric engine or new track systems will remain in the final proposal, these are just two examples of the way emerging technologies could transform how mechanized infantry contributes to combined-arms operations.

OMFV will integrate APS from the beginning of development. These APS capabilities, coupled with improvements in passive armor, will allow OMFV to better protect against a range of incoming projectiles. Advancements in network data links will facilitate the sharing of targeting information with unit commanders, allowing better, faster decisions to be made assigning the best shooter to the right target. GCIA allows the Army to cost effectively update or exchange APS and other capabilities as technologies improve and threat capabilities evolve.

NGMBT

While work continues on upgrades to the Abrams tank, Army senior leaders challenged the Army and industry to explore the potential capabilities and technologies for a possible future NGMBT. Research on NGMBT characteristics of need is in the early stages, focused on the observations from recent conflicts abroad and strategic guidance from Army senior leaders, as well as experiments and touchpoints with Soldiers and units from the operating force.

This effort is also leveraging lessons-learned from the development of OMFV and of another platform, mobile protected firepower, which is slated for delivery to infantry BCTs starting in 2025. These lessons are informing the NGMBT experimentation and analysis.

While the requirements for an NGMBT are early in the development phase, several characteristics rise in importance. NGMBT must reduce the overall weight of the vehicle. A lighter vehicle creates operational and strategic advantages for the Army and the Joint force.

NGMBT will also:

- Provide improved survivability and force protection;
- Allow increased mobility and improved transportability compared to the Abrams;
- Increase lethality through next-generation fire control and improved accuracy;
- Reduce logistical impact to the ABCT and increase operational range and endurance; and
- Provide growth margins for future capabilities.

Conclusion

As each platform is delivered, it is important to note that the Army is taking a holistic approach to transforming our units. Integral to the development of new armored vehicles is a focus on how sustainment looks in the future. As the Army moves toward more hybrid-electric vehicles, batteries grow in importance and development of these capabilities continue alongside the development of the vehicles themselves.

Lighter vehicles increase operational mobility over varying road networks and bridges. Vehicles designed to be more climate-resistant can operate in the extreme temperatures – hot or cold – in which they may be required to perform. Across all fronts, advancements are being made.

The work to transform the capabilities of the Army's ABCTs continues as a team effort. NGCV CFT will focus on experimentation and requirements development to deliver Soldiers and leaders combat vehicles that can see more and sense farther than our adversaries; maintain low signatures and footprints while remaining highly lethal; allow our forces to converge at the time and place of our choosing to present our adversaries multiple dilemmas; and achieve new levels of protection, reliability and connectivity.

Dan Heaton is director of communications for NGCV CFT, based at Detroit Arsenal, MI. Mr. Heaton – a U.S. Navy veteran – is also serving as a senior master sergeant public-affairs specialist in 127th Wing, Michigan Air National Guard. Previous jobs include public-information officer, Macomb County, MI; manager, media relations, Macomb Community College, MI; and newspaper reporter in Michigan and Illinois. Mr. Heaton holds a master's of arts degree in marketing from Walsh College, a master's of science degree in management, also from Walsh College, and a bachelor's of arts degree in human resource management from Spring Arbor University.

Acronym Quick-Scan

ABCT – armored brigade combat team
AMPV – Armored Multi-Purpose Vehicle
APS – active protection system
BFV – Bradley Fighting Vehicle
GCIA – G(round Combat Systems) Common Infrastructure Architecture
MOSA – Modular Open-System Architecture
NGCV CFT – Next-Generation Combat Vehicles Cross-Functional Team
NGMBT – Next-Generation Main Battle Tank
OMFV – Optionally Manned Fighting Vehicle

Transforming to Armored Combat-Engineer Company: Purpose-Built Solution for Armored Force in Large-Scale Combat Operations

by COL Anthony P. Barbina, MAJ John Kearby, CSM Robert C. Lake, 1LT Catherine Lynch, MAJ Paul K. Wyatt

It is 4:22 a.m. at the National Training Center (NTC) and 87th Sapper Company is breaching a complex mine-wire obstacle in Brown Pass. The 3rd Cavalry Regiment is in attack positions just north of Hill 910, ready to assault through the pass and on toward its objective near Crash Hill. The 87th Sapper uses its M113 Armored Personnel Carriers (APCs), equipped with .50-caliber machineguns and towing mine-clearing explosive-line charge (MICLIC) trailers, to approach and breach a lane through the obstacle belt. As it moves to secure the far side of the breach, 87th encounters a company of boyeva mashina pekhoty (*BMP-3) Russian fighting vehicles approaching from inter-visibility lines in the west. The BMP-3s effectively scoff at the Sapper M113s, and they quickly shred the engineer formation and reoccupy Brown Pass – spoiling 3rd Cavalry's attack on Crash Hill.*

For engineers, this scenario is as familiar as it is frustrating. The "Brown Pass" is a complex piece of terrain, but even with 87th executing a technically correct breach, it could not open a lane due to the inferiority of its equipment and the obvious gaps in its force structure. The U.S. Army Engineer Regiment recognizes the limitations of its mechanized formations and has recently developed a solution: the combat-engineer company-armored (CEC-A).

Transformation effort

The engineer regiment is in the process of modernizing combat-engineer formations – moving away from older maneuver-augmentation companies (MAC) and sapper companies toward the more capable and modern CEC-A.[1] The new formation brings significant engineer capability into the fight, but the pace of transformation across the regiment has been slow.

The 36th Engineer Brigade, III Armored Corps, headquartered at Fort Hood, TX, has multiple companies at various stages of this transformation effort, and it's uniquely positioned to observe and analyze the performance of different company designs. Through that experience, 36th Engineer Brigade concludes that the modern CEC-A represents a tailor-made solution for the armored force in large-scale combat operations (LSCO) as it offers the lethality and robust engineer capability the fight demands. We also advise that maneuver commanders energize the process of transformation because seizing the training and equipping initiative will better enable fighting with these new engineer formations in the near future.

Figure 1. An 87th Sapper M113 APC tows a MICLIC trailer at NTC, Fort Irwin, CA. *(U.S. Army photo)*

Engineer-company structures

There are several engineer formations that currently support armored units: Alpha and Bravo Companies within the brigade engineer battalions (BEBs), MACs, sapper companies and the newly forming CEC-A companies are housed within engineer brigades. The CEC-A structure currently includes both a legacy build sourced with "in-lieu of" platforms[2] and the fully outfitted modern CEC-A (Figure 2).

- The BEB companies are M2A3 Bradley Fighting Vehicle-based formations with Assault Breacher Vehicles (ABVs), Joint Assault Bridges (JABs) and D7 bulldozers. MAC and sapper companies are equipped with M113s, towed MICLIC trailers and the M60 chassis-based Armored Vehicle Launched Bridges (AVLBs).
- The legacy CEC-A is a partially sourced formation that adds D6 bulldozers and M136 Volcano minelaying systems to the MAC/sapper formations.
- The fully modern CEC-A is equipped M2A3 Bradleys, ABVs, JABs, D7 dozers and Volcano systems. CEC-A offers a similar package as the Company A in a BEB but with more

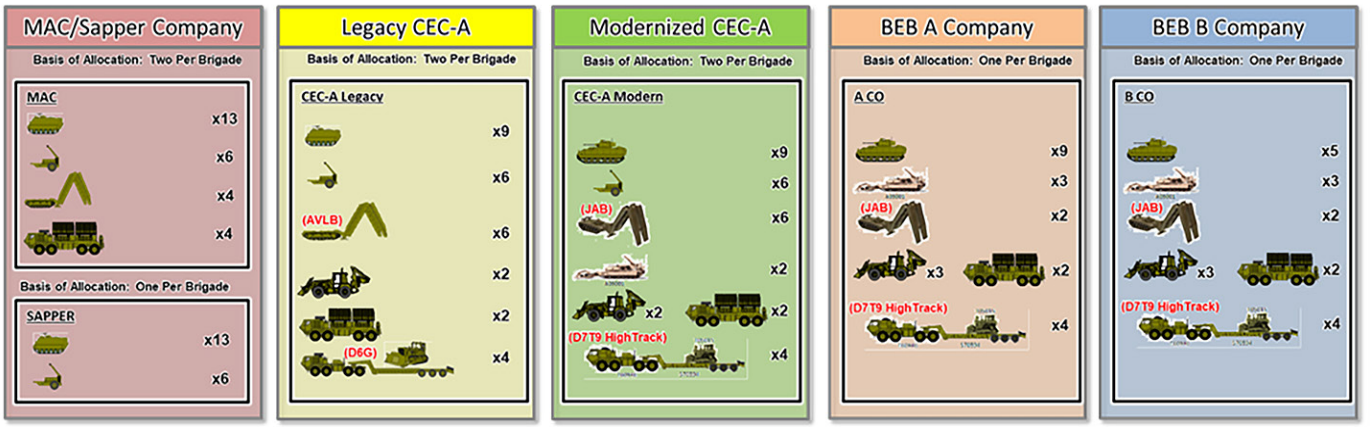

Figure 2. Engineer-company comparison of key equipment.

sapper dismounts and a greater number of engineer platforms.

When it comes to supporting the armored fight, the effectiveness of these formations can vary widely, but the BEB and modern CEC-A companies provide the rawest engineer capability.

Integration with armored force

The 59th MAC and 87th Sapper Company, both with 36th Engineer Brigade, were among the first companies across the Army to begin CEC-A transformation. The 59th was structured as a modernized CEC-A, and 87th as a legacy CEC-A. Both recently participated in NTC rotations supporting 2nd Armored Brigade Combat Team (ABCT) of 1st Cavalry Division and 3rd Cavalry Regiment respectively in Spring 2022. With these rotations as a basis for comparison, when compared with the MAC and sapper companies, the CEC-A better integrates with maneuver forces and provides the requisite lethality to be a contributing member of the team.

The armored fight demands speed, audacity and a vigilant maintenance of the initiative. The modern CEC-A can support that demand from armored maneuver forces in a way the older designs cannot. In its rotation with 2nd ABCT, 1st Cavalry Division, 59th CEC-A was able to keep pace and maneuver alongside the combined-arms battalions without any interruption to the operational tempo, and the unit's M2A3 Bradleys provided welcome combat power and security to 2nd ABCT, 1st Cavalry Division.

In contrast, 87th Sapper struggled to keep up with 3rd Cavalry Regiment during NTC 22-07, as its M113s were significantly slower and less capable than the armored force demanded. An M113 APC towing a MICLIC trailer is only capable of traveling at 15 kilometers an hour off-road, which falls well short of the 31 kilometers an hour of an M2A3 Bradley or the 40 kilometers an hour of an M1 Abrams main battle tank.

In addition to speed, the lethality of the Bradley vs. the M113 further points toward the superiority of the modern CEC-A. An M113 is equipped with an unstabilized M2 .50-caliber machinegun, which is of little use in a mechanized conflict. During NTC 22-07, 3rd Cavalry had to leverage more maneuver assets to secure 87th Sapper as it moved around the battlefield to prevent loss of the high-value engineer targets.

In contrast, the M2A3-equipped 59th CEC-A had 25mm Bushmasters, modern optics and tube-launched, optically tracked, wire-guided missiles, which enabled it to move freely around the battlefield and represented more combat power for 2nd ABCT, 1st Cavalry Division, to employ.

These examples support the claim that the CEC-A design represents an improvement over the older formation designs.

A direct comparison of companies is also instructive when assessing the potential lethality of each formation design. Figure 3 highlights the potential lethality values of each engineer-company type as it relates to a brigade allocation. For example, current ABCTs include both companies A and B from the BEB, and, as such, two CEC-As are expected to be allocated to each redesigned armored brigade. Reviewing the figure, the modern CEC-A and BEB designs provide equivalent maneuverability and Javelin values, but the CEC-A includes another M2A3 Bradley platoon of combat power.[3] It is also apparent that the sapper and legacy formations bring a less-effective combat formation to the armored fight.

Engineer capabilities provided to armored force

During LSCO, engineers are typically

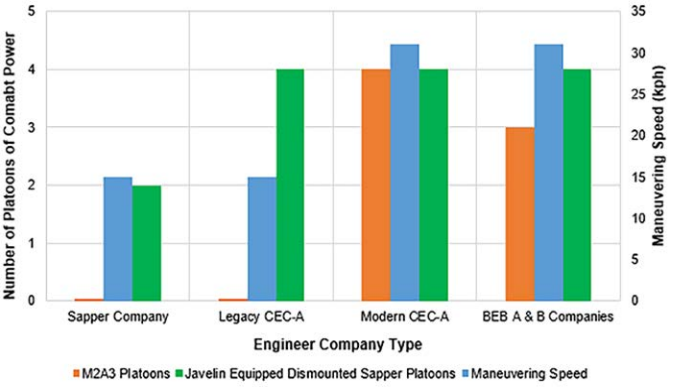

Figure 3. A lethality comparison of engineer-company designs based on brigade allocation. The BEB and CEC-A build provide significant value, with a slight advantage toward the CEC-A based on the additional M2A3 platoon.

tasked to provide mobility, countermobility and survivability support to the armored force.[4] This manifests as support to the breaching, obstacle emplacement and protection efforts of the supported unit. When comparing the effectiveness of 87th Sapper and 59th CEC-A during their rotations, the preferred formation becomes obvious.

Focusing first on mobility, during NTC 22-06, 59th CEC-A self-secured and breached a complex obstacle belt in Whale Gap, demonstrating the flexibility and capability of its formation. As the breach-force commander, 59th CEC-A reduced, proofed and marked a lane through a mine-wire obstacle with an ABV-launched MICLIC and crossed an anti-vehicular ditch using its JAB. As the assault force was passed, the minefield was reseeded by enemy artillery, and the ABV was able to quickly pivot and reopen the lane with its second MICLIC, maintaining momentum through the breach for 2nd ABCT, 1st Cavalry Division.

This would have been impossible for the M113-based 87th Sapper. Its single-shot, towed MICLIC trailers with limited proofing and marking capability would have halted all forward movement in the breach. The 3rd Cavalry identified these weaknesses during its rotation and subsequently struggled to employ 87th Sapper effectively during breaching operations. The slower speed, additional security requirements and limited breaching capability injected more complexity into an already challenging operation. As a result of this and other factors, 3rd Cavalry's breaching efforts were not successful during the rotation, and valuable momentum was lost during offensive operations.

Figure 4. A 59th CEC-A ABV proofs a lane during NTC 22-06 with 2nd ABCT, 1st Cavalry Division. *(U.S. Army photo)*

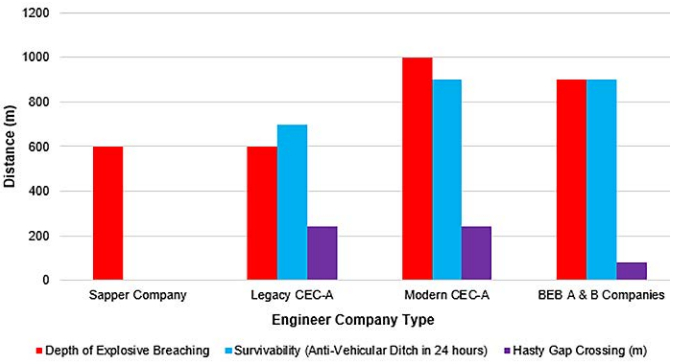

Figure 5. Engineer-capability comparison of engineer-company designs based on brigade allocation. The modern CEC-A provides the most value based on these metrics.

In terms of countermobility and survivability capabilities, the modernized CEC-A has obvious advantages in terms of its equipment and structure that translate into operational advantages for the maneuver force. The CEC-A is equipped with D7 bulldozers that yield 30 percent more obstacle and survivability effort as compared to their older D6 bulldozer counterparts.[5] This, coupled with the direct-fire overwatch of the M2A3 Bradleys during obstacle construction, allowed maneuver commanders to concentrate efforts on the deep fight during defensive operations.

During NTC 22-06 with 2nd ABCT, 1st Cavalry Division, 59th CEC-A was able to self-secure and complete all planned obstacle efforts in the central corridor, whereas 87th Sapper was not able to meet 3rd Cavalry's planned obstacle requirements during NTC 22-07. Therefore, 3rd Cavalry struggled to allocate the necessary security forces to the 87th during its obstacle construction efforts. As a result, disruption efforts by enemy forces prevented the work from being completed before defend time.

The lesson is that the equipping and manning advantages the modern CEC-A has over the older formation are apparent, and these advantages have powerful secondary effects on the maneuver fight.

Reviewing the equipment within each formation also provides some ability to assess the value each set contributes to a supported brigade. Figure 5 describes the distances in explosive breaching, anti-vehicular ditch construction and hasty gap crossing[6] each formation type provides. Reviewing this graphic, legacy CEC-As offer increased value over the sapper formation, but both lag significantly behind the BEB and CEC-A structure.

The CEC-A provides greater hasty gap-crossing capability based on more JAB platforms and greater explosive breaching capability as it possesses MICLIC trailers in addition to its ABVs. However, the BEB does possess two more ABVs than the CEC-As, so it contributes greater kinetic and rapid breaching capability. When comparing the practical performance of these companies and reviewing the capabilities of their formations, it's clear the CEC-A formation lends most value to the armored brigade.

Energizing transformation

In the near-term, assessing the effectiveness of different engineer-company designs is useful because it allows us to identify capability gaps and develop a more complete understanding of how to fight various engineer formations. In the long-term, it should help convey the point that the CEC-A represents the preferred design, and we need to accelerate the current pace of transformation to get to that structure as quickly as possible.

The 36th Engineer Brigade is in the early stages of this modernization effort,

with only a few fully equipped CEC-As and a limited number of other companies actively transforming. Recently the pace of modernization has slowed dramatically as equipment and funding are routed to worthy pursuits elsewhere. That said, there are sourcing opportunities and funding solutions that could do with the endorsement of maneuver commanders and the Armor Branch.

This modernization effort occurring within the engineer regiment is in response to the pending updates to the Army force structure and is ultimately in line with a return to a more division-centric force.[7] We petition maneuver commanders at echelon to look for opportunities to help facilitate the modernization of engineer companies toward CEC-A formations because it will directly benefit the performance of their formations.

The 36th Engineer Brigade has seen firsthand the difficultly in equipping and retraining these companies from a standing start. Sourcing units with "in-lieu of" equipment, struggling to train Soldiers on new platforms and fundamentally changing the identity of a company has proved non-trivial. We expect that these transformations will occur under the current force organization, but we do see risks as world events could prompt a more rapid shift. We advise maneuver commanders to lean forward into developing habitual training relationships with newly forming companies and support them in outfitting their units. We believe these efforts will lead to a more lethal armored force, with the new engineer companies better suited to support maneuver in their missions.

Conclusion

After evaluating the performance of various engineer-company formations, it's apparent the modern CEC-A provides significant value to the armored force. While fully transforming an older formation into a modern CEC-A may seem costly in the near-term, it should be viewed as an investment in the future of the armored formation.

The modern CEC-A represents a purpose-built solution for supporting an armored force during LSCO. It's a faster and more lethal design, capable of delivering greater engineer effort more consistently to the armored force. This makes it the engineer company of choice for maneuver commanders. We again advise maneuver leaders to energize the transformation and modernization of engineer companies as opportunities arise. Seize the initiative and aggressively build out these enabling formations as they provide invaluable capability and enable the violence of action that we demand in an armored attack – especially considering the state of world affairs.

COL Anthony Barbina commands 36th Engineer Brigade, Fort Hood, TX. Previous assignments include commander, New England Recruiting Battalion, Kittery, ME; commander, 70th BEB, 1st Stryker Brigade Combat Team, 25th Infantry Division, Fort Wainwright, AK; chief, Plans and Operations Division, U.S. Army Africa, Vicenza, Italy; executive officer, 1st Infantry Brigade Combat Team (IBCT) (A), 82nd Airborne Division, Fort Bragg, NC; and executive officer, 1st Brigade Special Troops Battalion, 1st IBCT (A). COL Barbina's military schools include Ranger Course, Sapper Leader Course, Jumpmaster Course, Airborne School, Air-Assault School, Cold Weather Leader's Course, Mechanized Leader's Course, Joint Engineer Operations Course and Recruiter Commander's Course. He has a bachelor's of science degree in engineering from the U.S. Military Academy (USMA), a master's of science degree in engineering management from Missouri University of Science and Technology, a master's of business administration degree in global business from the University of Phoenix, a master's of military arts and science degree in operational arts from the U.S. Army Command and General Staff College and a master's of science degree in strategic studies from the U.S. Army War College. COL Barbina's awards and honors include the Bronze Star Medal, Meritorious Service Medal, Joint Service Commendation Medal, Department of State Meritorious Honor Award and the Combat Action Badge.

MAJ John Kearby is the chief of operations, 36th Engineer Brigade. Previous assignments include assistant professor, Department of Mathematical Sciences, U.S. Military Academy; commander, Company A, 91st BEB, 1st ABCT, 1st Cavalry Division, Fort Hood, TX; task-force engineer, 2nd Squadron, 12th Cavalry Regiment, 1st ABCT, 1st Cavalry Division; and battalion logistics officer, 307th Engineer Battalion (C) (A), 20th Engineer Brigade, Fort Bragg. MAJ Kearby's military schools include Air-Assault School, Airborne School and Ranger School. He has a bachelor's of science degree in civil engineering from USMA, a master's of science degree in operations research from North Carolina State University, a master's of science degree in civil engineering from Missouri University of Science and Technology and a master's of science degree in systems engineering from the University of Texas at Dallas. MAJ Kearby's awards include the Meritorious Service Medal with oakleaf cluster.

CSM Robert Lake is the brigade command sergeant major, 36th Engineer Brigade. Previous assignments include senior-enlisted maneuver-support trainer (Sidewinder 40), Operations Group, Fort Irwin, CA; command sergeant major, 39th BEB, 2nd IBCT, 101st Airborne Division (Air Assault), Fort Campbell, KY; first sergeant, Headquarters and Headquarters Company, 19th Engineer Battalion, 20thEngineer Brigade, Fort Knox; first sergeant, 502nd Multi-Role Bridging Company, 19th Engineer Battalion, Fort Knox; and combat-engineer professional-development noncommissioned officer, Human Resources Command, Fort Knox. CSM Lake's military schools include Basic Leader's Course, Advanced Leader's Course, Air-Assault School, Drill Sergeant School, Modern Army Combatives Level I and II, Senior Leader's Course and the U.S. Army Sergeants Major Academy. He has associate's of arts degree in general studies from Central Texas College and a bachelor's of science degree in management from Park University. CSM Lake's awards and honors include the Bronze Star Medal, Meritorious Service Medal and Combat Action Badge.

1LT Catherine Lynch is a tactical officer, 20th Engineer Battalion, Fort Hood. Previous assignments include executive officer, 59th Combat Engineer

Company-Armored, 20th Engineer Battalion; mobility-platoon leader, 59thMobility Augmentation Company, 20th Engineer Battalion; and assistant plans officer, 20thEngineer Battalion. 1LT Lynch's military schools include the Engineer Basic Officer Leader's Course. She has a bachelor's of science degree in mathematics from Mount St. Mary's University. 1LT Lynch is a recipient of the Army Engineer Association's Engineer De Fleury Medal.

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Notes

[1] Modified table of organization and equipment, 59th Combat Engineer Company, February 2022.

[2] Ibid.

[3] Ibid.

[4] Army Techniques Publication (ATP) 3-90.4, ***Combined-Arms Mobility***, June 2022.

[5] ATP 3-90.8, ***Combined-Arms Countermobility***, November 2021.

[6] ATP 3-90.4, ***Combined-Arms Mobility***, June 2022.

[7] LTG Theodore Martin, U.S. Army Combined Arms Center, "Waypoint in 2028 – Multidomain Operations," December 2021. https://www.youtube.com/watch?v=OUZp01CjdiI.

Acronym Quick-Scan

ABCT – armored brigade combat team
ABV – Assault Breacher Vehicle
APC – armored personnel carrier
ATP – Army techniques publication
AVLB – Armored Vehicle Launched Bridge
BEB – brigade engineer battalion
BMP – *boyeva mashina pekhoty* (Russian fighting vehicle)
CEC-A – combat-engineer company-armored
IBCT – infantry brigade combat team
JAB – Joint Assault Bridge
LSCO – large-scale combat operations
MAC – maneuver-augmentation company
MICLIC – mine-clearing explosive-line charge
NTC – National Training Center
RES – regimental engineer squadron
USMA – U.S. Military Academy (West Point)

Light Infantry Squad Vehicles: Keeping the Cavalry Lethal

by 1LT Charles B. Ovens

The current change affecting U.S. mounted cavalry assets is the ability to rapidly maneuver in restricted terrain with minimal signatures. This change is on display in the 2022 Russo-Ukrainian War, and it's affecting how armor and mounted assets are viewed. As a result, the United States must seek lighter and smaller approaches to cavalry assets to disburse elements and extend supporting distances. This tactic has proved disruptive to Russian armor formations as Ukrainian utility terrain vehicles (UTVs) armed with anti-tank guided missile platforms are effectively attriting Russian vehicles.

U.S. forces should follow Ukrainian tactics in augmenting UTV-like platforms during testing throughout our cavalry squadrons. Current squadrons using platforms such as the Bradley M3, Stryker and humvee have focused on an anti-armor/armored personnel carrier style of fighting, the type of combat U.S. forces expect from Russia and China. With methods such as small unmanned aerial vehicles and Javelins prevailing as the modern tactics of the day, cavalry squadrons now face a dilemma of risking maneuverability over survivability in today's operating environment. With current tactics surrounding the ability to maneuver, we find through these recent conflicts that armored vehicles become key targets to our adversaries, putting us out of the fight instead of keeping us in it. By lowering vehicle signatures, U.S. cavalry forces can prevent becoming targets to enemy dismounts.

Solution

Adding platforms such as the MRZR Alpha (a new light tactical vehicle), the purpose-built, ultra-light Deployable Advanced Ground Off-Road (DAGOR) vehicle and the Infantry Squad Vehicle (ISV) would allow cavalry squadrons to add more flexibility and maneuverability to their elements while keeping unit signatures low. Creating platoons with four humvees/two ISVs per platoon or three humvees/three ISVs will allow a mounted push/pull that will spoil near/far ambushes, protect platoons' flanks and lower platoons' battlefield signature while strengthening their ability to conduct reconnaissance.

Light vehicles in this realm allow troopers to extend their mutually supporting distances – creating vehicles purely for a platoon's dismounts – and allowing maneuverability while covering them with M-240L, M2 or MK19 machinegun platforms. These vehicle platforms also serve to push systems that are usually a burden to dismount teams – primarily anti-tank and anti-air weapon capabilities and larger, more reliable communication platforms – forward to the point of contention. This will allow dismounted teams access to key weapon and communication systems that enable cavalry troopers more flexibility with engagement criteria. It's also effective against heavily mechanized enemy forces that we expect to face in the future.

Field testing

Troopers of 3rd Platoon, Troop B, 3rd Squadron, 4th Cavalry Regiment, 3rd Infantry Brigade Combat Team (IBCT), in 25th Infantry Division, Schofield Barracks, HI, tested both the MRZR and DAGOR platforms while serving as the opposing force (OPFOR) during the 2nd IBCT, 25th Infantry Division's "Nakoa Fleek" training exercise in Hawaii. Troopers used these platforms in three ways to:

- Extend the range of the platoon's screen in depth;
- Decrease the time to maneuver dismounts; and
- Increase survivability of observation posts (OPs).

The methods used to achieve this was by extending push/pull capabilities, maneuvering dismount teams farther from gun trucks to set up better long-duration OPs and simultaneously emplacing the vehicle in a hide site close by. The 3rd Platoon operated in a split-section concept, with two humvees and one light dismount vehicle. Both the MRZR and DAGOR were transported to the exercise by CH-47 helicopter air movement, certifying the ability to load the vehicles internally as well as by slingload.

Figure 1. 3rd Platoon, Troop B, 3-4 Cavalry Regiment conducts an air insertion to test DAGOR capabilities in diverse terrain during rapid deployment. *(U.S. Army photo by 1SG Kristopher Moore, Troop B, 3-4 Cavalry, 3rd IBCT, 25th Infantry Division)*

Figure 2. Soldiers test the Polaris MRZR Alpha platform through terrain previously impassable by current U.S. light platforms. *(Photo by Polaris Government and Defense. Used by permission.)*

Advantages identified

The 3rd Platoon found success using these platforms while conducting a screen for the OPFOR's defending company. Both vehicles allowed the platoon to emplace OPs advantageous to the OPFOR unit. With the MRZR's small signature, it allowed troopers to easily create a hide site the enemy did not find. This allowed 3rd Platoon to observe the enemy main element and inform the OPFOR company of the enemy's avenue of approach (AoA).

Furthermore, the DAGOR dismount team created a hide site and dismounted to an OP 75 meters from the platform in the enemy's main AoA. The DAGOR dismount team worked in a team with a M2 .50-caliber gun truck to support them 250 meters behind. Once in contact, the DAGOR team retrograded behind the gun truck that engaged enemy dismounts while the DAGOR moved to its secondary position and continued to observe enemy maneuvers.

Observers/coaches/trainers adjudicating the lane said the platoon-plus element the team encountered was engaged and destroyed by the actions taken by the DAGOR/humvee team. Therefore, pairing lightly armed and maneuverable vehicles with MK19 or M2 gun trucks was what we found to be the best course of action for the platoon's mission.

Problems identified

Multiple issues were observed while testing the integration concept. Neither vehicle had the ability to mount a radio, which forced 3rd Platoon troopers to expend two of the dismounted radios. This limited the amount of OPs 3rd Platoon could establish. Allotting platoons more dismounted 163 radio systems will allow them to have better communication and distance in a screen.

Both platforms have limited armor protection capabilities and could be decisively engaged by an M4 carbine system. Mounting M-240Ls on all similar platforms would not stop rounds from penetration but could provide suppressive fire long enough for a less lethal retrograde.

In the thickly vegetated Jungle environments inherent to 25th Infantry Division's area of responsibility, both platforms would be restricted in their maneuver off main supply routes, putting them in the same dilemma as current platforms. In this scenario, fully dismounted units would continue to prevail.

Overall

Evaluating the MRZR/DAGOR platforms validated new strategies for platoon-sized elements to successfully conduct reconnaissance. The 3rd Platoon's recommendation is for the U.S. Army and Chief of Armor to continue to validate new mounted tactics with similar vehicles and begin fielding them to all squadrons in infantry and Stryker brigade combat teams.

Every squadron across the Army would see great benefits by using these platforms. Therefore, testing should continue for this concept in longer mission sets such as at the Joint Readiness

Figure 3. Students assigned to XVIII Airborne Corps' De-Glopper Air-Assault School prepare to slingload a Polaris DAGOR vehicle onto a UH-60 Black Hawk helicopter assigned to 2nd Assault Helicopter Battalion, 82nd Combat Aviation Brigade, at Fort Bragg, NC. *(U.S. Army photo by CPT Adan Cazarez, 82nd Combat Aviation Brigade)*

Figure 4. A UH-60 Black Hawk helicopter assigned to 2nd Assault Helicopter Battalion, 82nd Combat Aviation Brigade, lifts a Polaris DAGOR in support of XVIII Airborne Corps' DeGlopper Air-Assault School on Fort Bragg, NC. *(U.S. Army photo by CPT Adan Cazarez, 82nd Combat Aviation Brigade)*

Training Center at Fort Polk, LA, and the National Training Center at Fort Irwin, CA.

Seeing the concept work in a jungle environment points to validation-of-concept at squadrons across the Army. The squadrons should begin to test effectiveness across the multiple environments where the Army organically operates. Moreover, units should focus on training and validating dismounted OP teams and emplacing Javelin teams.

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Acronym Quick-Scan

AoA – avenue of approach
DAGOR – Deployable Advanced Ground Off-Road
IBCT – infantry brigade combat team
ISV – Infantry Squad Vehicle
OP – observation post
OPFOR – opposing force
UTV – utility terrain vehicle

Mortars in Cavalry Troops: Current Problems,
Potential Solutions from an Observer/Coach/Trainer Perspective

by 1SG Kenneth D. Reavis and CPT Lee W. Schafer Jr.

Mortar sections assigned to cavalry troops have a unique role to play in the success of the cavalry squadron's mission. Unfortunately this role is often misunderstood, and mortars are frequently underused to the detriment of the troop's mission success.

Mortar sections in cavalry troops are often unable to perform mandated tasks due to lack of equipment or personnel, which results from confusing modified table of organization and equipment (MTOE) configurations by type of squadron. Through our direct observations of multiple cavalry troops conducting decisive-action training during two years at the National Training Center (NTC), it is evident that mortar sections can be better employed during home-station training. Cavalry troops can also increase lethality and fires integration through MTOE changes, understanding the purpose of mortars in cavalry units and by incorporating combined-arms training at troop level.

Current problems

The current cavalry-troop mortar section MTOE configuration does not provide mortar sections with the proper equipment or personnel to properly support the troop's mission. In infantry-battalion mortar platoons, the fire-direction center (FDC) is manned by four Soldiers independent of the mortar squads. In cavalry troops as well as Stryker infantry companies, this process is augmented by using the section leader and one squad leader to serve as both the chief and check computer, respectively. As it currently stands, the MTOE does not account for the FDC's required function; it doesn't provide the section leader the required equipment to perform the role as FDC chief.

Because of this, mortar sections must develop tactics, techniques and procedures (TTPs) to address this shortfall. This happens with varying degrees of success.

A problem specific to armored brigade combat team (ABCT) formations is the section leader's vehicle. That vehicle is currently a humvee with trailer, which differs from both infantry brigade combat team (IBCT) and Stryker brigade combat team (SBCT) formations – which have a Light Medium Tactical Vehicle (LMTV) with trailer. This configuration provides just less than one quarter of the ammunition able to be carried in an LMTV, thereby significantly decreasing the amount of time the mortar section can operate before needing to be resupplied.

A key personnel shortage in both the ABCT and IBCT formations is the lack of a driver for the section leader's vehicle. This is a shortcoming which requires the section to remove a Soldier from one of the mortar squads to man the vehicle. Also, the M1165A1 humvees or the general-purpose Joint Light Tactical Vehicle (JLTV) equivalent assigned to IBCT formations prevent mortar sections from conducting local security while moving throughout the battlefield due to the inability to mount their assigned crew-served weapons. This requires the development of TTPs to remedy this issue, which often requires augmentation of security provided by maneuver platoons.

These examples of shortcomings in assigned equipment require each element to develop unique solutions to address issues that arguably should not exist.

Recommended MTOE changes

Recommended changes to the ABCT cavalry mortar sections' MTOE:

- Replace the section leader's humvee with an M1084 LMTV with materiel-handling equipment and trailer. Adding an M1084 LMTV and trailer will increase the section's ammunition capacity by 20,000 pounds, increasing the ability to carry ammunition from 128 rounds to 544 rounds,[1] bringing near parity in its ammo capacity with mortar sections in IBCTs and SBCTs. This will increase the troop's flexibility to operate for extended periods to provide more options to the commander.
- Add a driver to operate the section leader's vehicle (military-occupation specialty (MOS) 11C10). Adding a driver allows the section leader's vehicle to be manned without taking a Soldier from a mortar track to operate his vehicle.
- Add an M151 Mortar Fire-Control System-Dismounted (MFCS-D) FDC variant to the section leader's vehicle. Adding FDC equipment enables the section leader to properly perform his doctrinally assigned duties as the FDC chief.[2]

Recommended changes to the SBCT cavalry mortar sections MTOE:

- Add an M151 MFCS-D (FDC variant) to the section leader's vehicle. Adding the FDC equipment will allow the section leader to properly perform his role as the FDC chief.
- As it stands currently, the SBCT formation is the best equipped and most flexible of all the cavalry mortar sections. This is due to its extensive

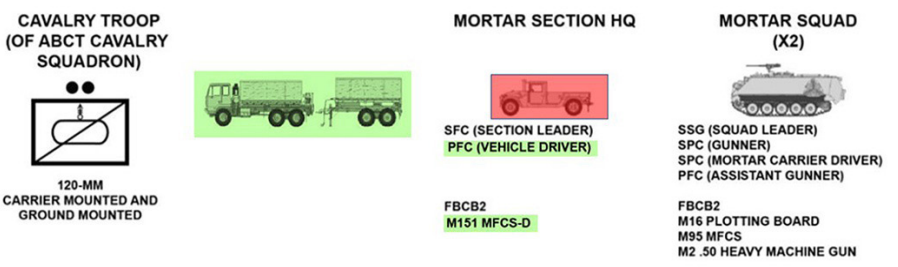

Figure 1. Recommend changes to the ABCT cavalry mortar section. Note for all three figures: Deletions are highlighted in red, additions are highlighted in green. *(Graphic adapted from Army Techniques Publication (ATP) 3-21.90)*

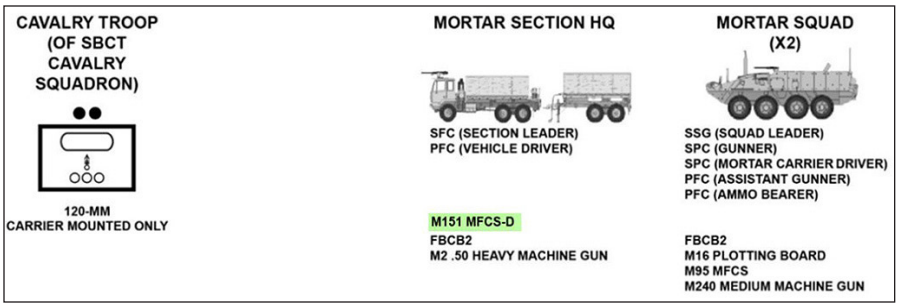

Figure 2. Recommend changes to SBCT cavalry mortar section. *(Graphic adapted from ATP 3-21.90)*

ammunition capacity and its 12 assigned Soldiers, compared to nine Soldiers in both ABCT and IBCT formations.[3]

Recommended changes to the IBCT cavalry mortar sections MTOE:

- Replace both M1165A3 humvees (or general purpose JLTV variant) with M1151 uparmored humvees (or heavy gun carrier JLTV variant). Adding uparmored humvees allows the section to provide local security while maneuvering due to its ability to mount their crew-served weapons. This will increase flexibility and protection for mortar sections by enabling them to provide their own local security.
- Add three Soldiers (MOS 11C10). One Soldier will fill the currently vacant role as the section leader's driver. The other two Soldiers will perform crew-served gunner roles on the humvees to provide local security and assist as additional ammunition bearers in low-threat areas.
- Add an M151 MFCS-D to the section leader's vehicle. Adding the FDC equipment will allow the section leader to properly perform his role as the FDC chief.[4]

Roles and responsibilities

The role of the mortar section within the cavalry troop is unique compared to a battalion mortar platoon and is often misunderstood. More specifically, it's the section leader's role within the troop that's misunderstood. Different from a mortar platoon, the mortar-section leader is charged with performing the same duties and warfighting functions as the mortar-platoon leader, platoon sergeant and fire-direction chief.[5] In defiance of doctrine, some units assign him/her with additional responsibilities or duties such as supervising the troop-headquarters section.

The mortar-section leader is responsible for not just his/her section but must also assist in planning fires and ensuring they are nested with the maneuver plan. The mortar-section leader must be involved and present in the troop-planning process to effectively incorporate the troop's mortars and remain synchronized. The fire-support officer (FSO) is not organic to the troop and is frequently absent for all but higher-level collective-training exercises. Therefore the role of the section leader is vital in fires planning to ensure the seamless integration of a new FSO into the process. When the commander solely relies on his FSO to assist in fires planning without the mortar-section leader involved, synchronization between the fire and maneuver plan is seldom achieved.

Also, complete understanding of the clearance of fires process at the troop level is often misunderstood. If not specified otherwise, the troop commander is the clearance authority for his mortars within his assigned sector or area of operation. This usually causes problems when aircraft are involved, or clearly defined boundaries or positions between troops or adjacent units are not established. If a squadron does not establish clear boundaries, then troop commanders must make them and coordinate with adjacent units.

Therefore the mortar section and the troop command post must remain synchronized, with each maintaining current and accurate maps and graphics, digital and analog. This creates a true common operating picture, containing both graphic-control measures and fire-support coordination measures, and ensures it's shared with squadron.

Training deficiencies, solutions

Combined-arms training at troop level is often neglected at home station, and the incorporation of indirect fires with combined-arms maneuver is frequently executed for the first-time during combat-training-center rotations. This stems from a variety of issues such as a condensed training schedule, lack of cooperation with fire-support elements assigned to field-artillery battalions, or two parallel but unsynchronized training plans between fires and maneuver. The latter is normally the major issue and is prevalent throughout most cavalry squadrons.

When it comes to mortar gunnery and qualification, there is usually a knowledge gap at both the troop and squadron level. There is no mortar master gunner course in the Army; therefore current master gunners have no formal knowledge of mortars. The linchpin in this process is the mortar-section leader. In successful units the senior section leader is the one driving the mortar training plan for the squadron. However, the systemic lack of

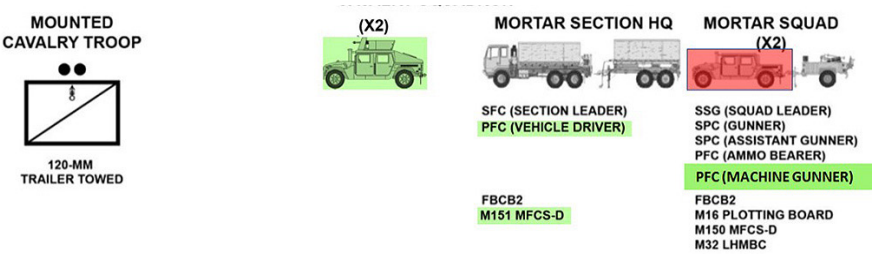

Figure 3. Recommend changes to IBCT cavalry mortar section. *(Graphic adapted from ATP 3-21.90)*

formal mortar knowledge within the squadron often prevents commanders from understanding or identifying underperforming mortar sections.

As an alternative, we recommend units conduct their Mortar Training and Evaluation Program (MORTEP) concurrent with a unit's tank/Bradley/Stryker gunnery program. Squadrons should consolidate their troop mortar sections under the control of the senior mortar-section leader in the squadron, and train and test gunner and FDC exams concurrent with the squadron's Gunnery Skills Test training/testing program. Unless the squadron's master gunner is an Infantry Mortar Leader's Course (IMLC) graduate, the master gunner should not develop a detailed mortar training plan but should instead align resources so the MORTEP can happen concurrent with crew gunnery.

By conducting the MORTEP concurrent with crew gunnery, the training glidepaths between vehicle crews and mortar squads stay aligned. The gunner and FDC exams must be evaluated by an IMLC graduate external to the section or a battalion mortar platoon's platoon sergeant.[6] Once complete with gunner and FDC exams, the consolidated mortar sections can complete mortar gunnery Tables II (preliminary live-fire simulations) and III (drills) in garrison with internal evaluation.[7]

MORTEP Tables IV-VI are all conducted as live-fire events on a range. The squadron's fire-support element should provide overall command and control for the training event because forward observers are recommended for Table IV (basic)[8] and required for Tables V and VI.[9] While the execution of the event should be led by the squadron's FSO, troops from across the squadron must also provide the requisite range support. The brigade must also task another battalion's mortar platoon to externally evaluate the squadron's mortar sections for Table VI (qualification).[10]

Although this article recommends that the squadron FSO oversee the MORTEP, commanders are ultimately responsible for the training proficiency of their mortar sections. Mortar-section leaders must backbrief their commanders on the MORTEP training plan early in the planning process to allow commanders to modify the training event if necessary to ensure all training objectives are met. Commanders must also oversee the MORTEP during each table to ensure each training event is being run properly and tasks are being trained to standard.

Following MORTEP, troop mortar sections must train during each collective-training event, starting at the section level. Beginning with situational-training exercises (STXs), scout sections must call for fire, and the entire fires approval and execution chain must rehearse its role in, at minimum, a simulated manner. Doing this properly requires the observer, section leader, platoon leader, FSO, troop commander and the mortar section clearance of fire rehearsed during each fire mission.

Mortar-section leaders must battle-track and serve as the FDC for each fire mission, and mortar squads must rehearse their crew drills up to hanging simulated rounds. During subsequent training events, from platoon STX training through brigade external evaluations, mortar sections (and the troop fire-support element) must continue to train their assigned tasks for every simulated fire mission. If mortar sections train their tasks during each simulated call for fire mission in all training events following the MORTEP, the mortar section will prove the most well-trained and well-rehearsed section in the troop.

Conclusion

An updated MTOE, greater clarity on roles and responsibilities, and increased combined-arms training at the section through troop levels will result in vastly improved mortar sections. While having mortars at the troop level gives cavalry troops a distinct advantage, if not properly incorporated they can become a wasted asset. The ability to effectively synchronize the troop's maneuver and fires plan consistently leads to greater success on the battlefield. Therefore understanding the shortcomings within our formations and recommending changes to better the force is the way forward. Although successful units find ways to make what they have work, starting with the right tools and people where they need to be will increase the effectiveness of these units.

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Notes

[1] ATP 3-21.90.

[2] Ibid.

[3] Ibid.

[4] Ibid.

[5] Ibid.

[6] Training Circular 3-20.33, ***Training Qualification and Mortars***.

[7] Ibid.

[8] Ibid.

[9] Ibid.

[10] Ibid.

Acronym Quick-Scan

ABCT – armored brigade combat team
ATP – Army techniques publication
BCT – brigade combat team
FDC – fire-direction center
FSO – fire-support officer
IBCT – infantry brigade combat team
IMLC – Infantry Mortar Leader's Course
JLTV – Joint Light Tactical Vehicle
LMTV – Light Medium Tactical Vehicle
MFCS-D – Mortar Fire-Control System-Dismounted
MORTEP – Mortar Training and Evaluation Program
MOS – military-occupation specialty
MTOE – modified table of organization and equipment
NTC – National Training Center
O/C/T – observer/coach/trainer
SBCT – Stryker brigade combat team
STX – situational-training exercise
TTP – tactics, techniques and procedures

Tested Maintenance Principles from National Training Center Rotation 22-07

by MAJ Patrick K. Kuiper and LTC Russell B. Thomas

Many authors write articles to address practical advice for Army leaders about maintenance. Two articles our unit found most beneficial in setting the groundwork for a solid maintenance program were "Winning the Maintenance Fight at Pace" by COL Michael Simmering[1] and "P4T3 Supporting 'Ready Now' Maintenance" by Chuck Brown.[2] Both articles provide specific technical advice to improve the maintenance program and posture sustainment for high-intensity operations.

After completing National Training Center (NTC) Rotation 22-07, where 3rd Cavalry Regiment trained in large-scale combat operations (LSCO) with greatly extended lines of communication compared to other rotations, we discuss in this article three general principles to consider when leading a maintenance program. NTC Rotation 22-07 validated that a maintenance program grounded in the principles of accountability, support and stability can thrive in LSCO over extended lines of communication.

Accountability

Several critical systems exist to enforce accountability for maintenance. One of the most important of these is the equipment-status report (ESR). The ESR is the Army's system of record for vehicle issues and parts ordering, and is the one true method for tracking maintenance. Often a new leader will feel pulled to develop or use non-standard accountability mechanisms (Microsoft Excel or PowerPoint trackers, for example) to understand and visualize the performance of their maintenance enterprise; however, the ESR must remain the exclusive document to visualize performance.

The ESR's prominence as a tool is critical. The ESR lets anyone in the maintenance enterprise understand current faults on a piece of equipment, the required corrective action status of parts required to fix it, in addition to a myriad of other data. When a maintenance fault occurs and is accurately annotated on the ESR, a demand signal to the Army that the item is broken is generated. These events occur nearly automatically to rectify the fault.

However, just as critical as an accurate and active ESR is the general concept of accountability. Leaders at every echelon must be held accountable for what is printed on the ESR. This print, and thus the faults and equipment status of the organization, must be weighed against practical, event-oriented operational performance. Operational performance at an event could be gunnery training, an impromptu deployment readiness "roll-out" drill or a company combined-arms live-fire. The ESR must be validated with equipment performance at these events and leaders must be held accountable via formal counseling and performance evaluations for the status of their equipment.

Leaders must ensure accountability for both the maintainer professionals and combat-arms organizations alike. We recommend a completely even divide

Figure 1. A pack change is made in the field during Operation Rifles Forge, a troop situational-training exercise/combined-arms live-fire exercise, at Fort Hood, TX. In February 2022. *(U.S. Army photo by MAJ Patrick Kuiper)*

when balancing time and effort toward assessing accountability between these organizations. For example, a unit with poor maintenance could be the result of an ineffective maintenance organization or a collection of infantry companies who do not execute proper preventive-maintenance checks and services (PMCS) with faults accurately annotated on the Department of the Army (DA) Form 5988E (Equipment Maintenance and Inspection Worksheet). Most often the fault lies near the middle between maintainers and the combat-arms organizations. Holding the appropriate organization to account for its shortfalls and encouraging all members of the organization to be great teammates is critical for overall success.

A culture of accountability within the organization need not be toxic or draconian. Rather, as on any good sports team, this accountability stems from mutual respect for one another and the requirements to ensure the overall success of the unit to fight and win in LSCO. During NTC Rotation 22-07, we found that once accountability, coupled with authority to act, were applied each member of the maintenance team strove to do their part and facilitate the success of the squadron.

Support

The maintenance specialists who have the primary responsibility to repair Army equipment require the support of end-users. These end-users are often combat-arms personnel such as vehicle drivers, gunners and commanders. If left to their own devices, many of these end-users would prefer to annotate a fault, bring the vehicle to a mechanic and ask for a message when the vehicle or equipment is ready for pick-up. In the Army, and especially a Stryker brigade, the number of mechanics is not nearly enough to allow for this type of support. When conducting LSCO, the number of repairs required due to the pace of operations simply requires all end-users to take an active role in supporting maintenance operations.

For successful maintenance operations in LSCO, both end-users and maintenance specialists must support one another as teammates to ensure equipment is sustained properly. Therefore, leaders at all levels must adjudicate this symbiotic support relationship to ensure all parties uphold the standards of their profession and occupational specialties. A maintenance program will only be successful when the support relationship is reciprocated by all.

This support relationship starts with an accurate and effective flow of the DA Form 5988E. During NTC Rotation 22-07, the standard flow of 5988Es was 72 hours. The troop executive officer would issue new 5988Es to the unit. All crews would conduct daily PMCS on their equipment using that same 5988E, and then on the third day the executive officer would retrieve the 5988Es from the unit (providing a new one with annotated faults from the last turn now on the print) and forward those to the unit-maintenance command post via the logistical resupply point.

With the regular push of 5988Es, faults were validated by embedded troop-level maintenance teams, updated in the Global Combat Support System-Army and placed on order. This same process was used on a staggered rotational 72-hour basis for weapons; communications equipment; nuclear, biological and chemical equipment; and vehicles. This rotation balanced generating accurate demand signals from equipment operators with the logistical overhead of the paperwork exchange, ensuring operators provided 5988Es updated on a class of equipment at every daily logistics package.

Providing support on the ground when a vehicle requires repair includes having the operator crews present for the duration of the work required to push the vehicle back in the fight. In Tiger Squadron (1st Squadron, 3rd Cavalry Regiment), we empowered crew members to conduct installation of simple parts, often "slash faults," so that the mechanics could focus their efforts on more difficult repairs. All repairs were inspected and certified by a mechanic, but items such as periscope repair, seat installation or side-mirror repair could often be installed by the crew. Leveraging operator crews to complete this work saves valuable mechanic time.

Also, the crew should always be on hand to assist the mechanics with installation of those more difficult tasks. This teamwork reduces the overall repair time significantly.

For a successful maintenance program in the field, it is critical that support goes both ways (maintenance specialist to end-user and back). Commanders and leaders at all levels must continually enforce and demand this cooperation from each teammate so the unit is as effective as it can be.

Stability

There is no perfect maintenance program in the Army. Every program can be improved, and it is true that each must continually strive to be better so it is as effective as it can be. However, before conducting a "bold shift" in a maintenance program, a commander should check whether an established system is being leveraged appropriately before inventing new methods to bring labor, parts or any other resource to bear against an existing program. The two published articles mentioned at this article's introduction provide excellent advice on systems to use for ensuring an effective maintenance program. Most often, consistent and simple battle-rhythm events – such as maintenance meetings, motorpool formations, equipment-service reviews and equipment inspections – provide the stability a maintenance program requires to thrive.

Maintenance is not a "surge" event. While there may indeed be times when a unit does have to surge on maintenance – such as following a large battle/training event or after a particularly long movement over difficult terrain – the preponderance of maintenance must be steady-state. With that in mind, leaders must develop a maintenance program based on established Army systems, enforce accountability of all members of the maintenance program and facilitate mutual support by all to make the program effective. If solid systems are in place, creating a unit norm during the friction of war and/or difficulties in the LSCO environment will only require minor adjustments to allow the organization to realize continued maintenance success.

Recent conflicts across the globe have demonstrated that the ability to fight over extended lines of communication is essential to maintaining tempo in today's current operational environment. A conscious and continuous application of the three principles *accountability, support* and *stability* will help units maintain high operational-readiness rates to fight and win in combat.

MAJ Patrick Kuiper is a doctoral student at Duke University. Previous assignments include squadron executive officer for 1st Squadron, 3rd Cavalry Regiment, Fort Hood, TX; squadron operations officer, 1/3 Cavalry Regiment, Fort Hood; operations officer, CJ33, Combined Joint Task Force-Operation Inherent Resolve, Baghdad, Iraq; assistant professor, Department of Mathematical Sciences, U.S. Military Academy (USMA); and master's student and Draper Fellow, Harvard University. He served in leadership positions at platoon and troop command levels in 2nd Infantry Division's 4th Stryker Brigade Combat Team and in 101st Airborne Division (Air Assault). His operational deployments include Operations Iraqi Freedom, New Dawn, Inherent Resolve and Enduring Freedom. MAJ Kuiper's military schools include Command and General Staff College (CGSC) (blended: Fort Belvoir, VA, and West Point) and Ranger School. He has a bachelor's of science degree in operations research from USMA and master of engineering degree in applied mathematics from Harvard University's School of Engineering and Applied Sciences. MAJ Kuiper's awards and badges include the Meritorious Service Medal, Bronze Star Medal and Ranger tab.

LTC Russell Thomas commands 1/3 Cavalry Regiment, Fort Hood. Previous assignments include aide-de-camp to the deputy commanding general, Army Futures Command, Austin, TX; interagency fellow, Office of Russian Affairs, Department of State, Washington, DC; senior instructor and commander, Specialist Wing, Australian School of Infantry, Singleton, Australia; and brigade operations officer, 1st Brigade, 1st Armored Division, Fort Bliss, TX. LTC Thomas' operational experience includes time in Stryker, armored and airborne-infantry units. He has three combat deployments in support of Operation Iraqi Freedom. LTC Thomas' military schools include CGSC and Ranger School. He has a bachelor's of science degree in civil engineering from USMA and a master's of science degree in environmental engineering from the University of Texas. LTC Thomas' awards and badges include Meritorious Service Medal, Bronze Star Medal, Combat Infantryman's Badge and Parachutist Badge.

Notes

[1] COL Michael J. Simmering, "Winning the Maintenance Fight at Pace," ***The Company Leader***, March 16, 2020, https://companyleader.themilitaryleader.com/2020/03/16/winning-the-maintenance-fight-at-pace/.

[2] Chuck Brown, "P4T3 Supporting 'Ready Now' Maintenance," ***Flightfax*** Edition 78, June 2019, chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://safety.army.mil/Portals/0/Documents/ON-DUTY/AVIATION/FLIGHTFAX/Standard/2019/Flightfax_78_June_2019.pdf.

Acronym Quick-Scan

CGSC – Command and General Staff College
DA – Department of the Army
ESR – equipment-status report
LSCO – large-scale combat operations
NTC – National Training Center
PMCS – preventive maintenance checks and services
USMA – U.S. Military Academy

Send Us Your Manuscripts

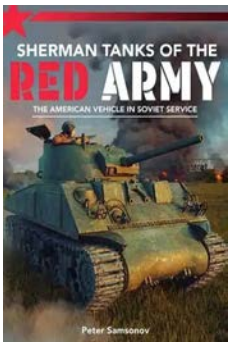
***ARMOR* magazine's manuscript suspenses for 2023:**

- **Spring 2023 edition: Feb. 11, 2023**
- **Summer 2023 edition: May 9, 2023**
- **Fall 2023 edition: July 18, 2023**

For planning purposes, *ARMOR* magazine suspenses are an average of 10-11 weeks before the edition is published.

BOOK REVIEWS

Sherman Tanks of the Red Army: The American Vehicle in Soviet Service by Peter Samsonov; Horncastle, United Kingdom: Gallantry Books; 2021; 123 pages including index, photos, maps; $19.99 hardcover.



The United States was called the Arsenal of Democracy during World War II, and with good reason. Through the Lend-Lease Program and other military-aid programs, the United States supplied its allies with significant quantities of military and dual-use hardware, ranging from destroyers to aircraft to boots to locomotives to food. For the Soviet soldier, American largesse brought the Jeep, P-39 Airacobra, tons of Spam, miles of communications wire and the ubiquitous Studebaker transport truck.

Ultimately the Red Army's spearhead was armored, and the Soviet-produced T-34 was perhaps the best tank of the war. It, however, was not alone; part of the aid the United States provided included the famous M4 Sherman tank. Peter Samsonov's quick and illustrated history of the Sherman under the Red Star is a welcome addition to the study of the American warhorse's service.

The book's author, Peter Samsonov, runs the highly informative and well-regarded Tank Archives blog (https://www.tankarchives.ca/). The blog publishes translations of Soviet and German documents related to armored warfare, as well as providing commentary on a variety of topics, mostly focused on World War II. Entries range from translations of production notes to in-depth analysis of the use of captured German fuel cans on Soviet armored vehicles. To say Samsonov is an expert in the field is an understatement. ***Sherman Tanks of the Red Army*** is his second book – the first was a history of the T-34's design.

The book consists of 15 chapters, with a glossary, notes and index. Chapters are short, often about 10 pages long, and amply illustrated. Indeed, the image-to-text ratio could belie some of the book's scholarly value. Each chapter is packed with descriptions of both the Sherman as a vehicle and as a weapon system in the larger context of the operation or campaign highlighted. Early chapters are dedicated to the technical nature of the Sherman, negotiations over their inclusion in Lend-Lease, trials conducted by the Red Army and modifications made to the tank over time.

Of minor note, some of the paragraphs, especially technical ones regarding maintenance and durability, would have been better presented as tables. Similarly, the maps could have been improved by format changes and the inclusion of keys to help readers understand the information presented.

With more than 4,000 Shermans joining the Red Army and proliferating across it, Samsonov has selected key events and campaigns to tell the Sherman's story in Soviet service. For Armor troops and commanders, the chapters on operational modifications and combat histories are the most valuable and engaging. The Red Army as an armored force was a learning organization that adapted to thinking and dedicated enemies in Germany and Japan. Samsonov does a solid job of interweaving the personal, often through award citations, the technical and the operational in the chapters that cover combat operations.

Readers interested in an American contribution to the Soviet war effort would do well to read Samsonov's work. Its quick, amply illustrated and documented style will appeal to both historians looking for a niche study and Armor professionals looking to learn from the past.

LTC TIMOTHY HECK
U.S. Marine Corps Reserve

Brutal War: Jungle Fighting in Papua New Guinea 1942 by James J. Carafano; Boulder, CO: Lynee Rienner Publishers Inc.; 2021; 283 pages; $55 (hard cover).

This was my paternal grandfather's war. I long wanted to know more about it. ***Brutal War*** is the book I searched for to understand PFC Samuel Jewel Heatherly's experiences in the green hell that was the New Guinea campaign.

From its first page, ***Brutal War*** grips the reader in a no-holds-barred account of what was arguably the most physically challenging battlefield of World War II. New Guinea was a poorly developed area for 20th Century mechanized warfare, possessing the bare minimum in coastal infrastructure necessary for warfighting. Farther inland, the island turned into a thick jungle with extreme weather changes, near-constant rain and a litany of deadly tropical diseases, making sustained military operations nearly impossible to conduct.

Carafano provides a carefully balanced account of the battle, making heavy use of primary sources from both sides of the conflict. Readers will gain an appreciation of the New Guinea campaign and its importance to Imperial Japan and the Allies. They will also become intimately familiar with the friction resulting from diverging Australian, United Kingdom and American national views on employing scarce military resources on New Guinea. Summed up, this is a book worthy of your time and money.

The author took a unique tack setting this book apart from so many others examining World War II. Carafano covers the Allied and Japanese strategic situations in depth to place the New Guinea campaign in perspective when compared to the larger, global war. (The actual fighting on New Guinea

proper does not make an appearance until Page 51.) This approach makes for an excellent primer on the general concepts of strategy development and in a more engaging narrative than normally found in the rather dry military texts on the same subject matter. Further, Carafano spends significant time discussing the all-important role the New Guinea people played in support of the Allied nations and Japan.

Carafano also examines the Japanese government's use of mass media, including its film industry, to ensure unquestioning support for the emperor and his expansionist policies. This proved to be one of the most interesting points of the book and one I personally would have enjoyed reading more about given the role information operations plays in 21st Century military operations.

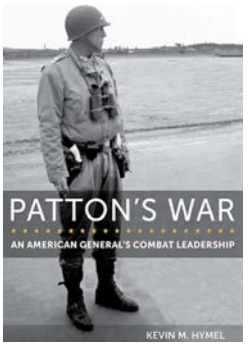
Perhaps the largest professional takeaway found in ***Brutal War*** is the need for assured logistical support on any battlefield, but particularly in immature theaters like New Guinea. As with so many other military campaigns, logistics played a decisive part in determining the ultimate victor on New Guinea. Initially, Japanese and Allied forces were essentially equal in their combat capabilities. Superior Allied logistics slowly but inevitably tipped the scales toward Allied victory over Japan at the strategic, operational and tactical level as America's "arsenal of democracy" moved to a wartime footing. Doctrinal development played a critical supporting role as well, although Carafano repeatedly addresses the Allied shortfalls in jungle warfare found in pre-war and early conflict doctrinal publications.

New Guinea provided an early example for the combatants (and the unfortunate civilians caught in the war zone) on what they should expect as the Allies advanced across the Pacific until Japan surrendered in August 1945. The hostility and brutal conditions experienced on New Guinea arose again in the Philippines, Okinawa and on mainland China. The campaign's impact would be felt long after at the international, regional and even individual level, making ***Brutal War*** a strongly recommended book for professional study.

(Author's note: PFC Samuel Heatherly returned to the United States in 1943 and died in 1961 from disease contracted while in New Guinea.)

LTC CHRIS HEATHERLY
U.S. Army Europe-Africa

Patton's War, An American General's Combat Leadership, Volume 1 by Kevin M. Hymel; Columbia, MO: University of Missouri Press; 2021; 436 pages; $32 hardcover, $29.99 Kindle.



Mention of the name GEN George S. Patton Jr. in military circles is all but guaranteed to start a discussion or even potential argument on his career as a U.S. Army officer. Much of Patton's actual life is buried under a veil of misinformation and myth, obscuring the actual man from being truly understood today.

Regardless of one's personal views, Patton remains among the best-known and most controversial U.S. Army generals – in no small part due to the award-winning 1970 biopic film simply titled ***Patton***. When considered against his peers, Patton clearly possessed the greatest drive, battlefield intuition and zeal for combat-focused training. He also held racist views, possibly suffered from post-traumatic stress disorder and placed low importance on the paramount task of working with allies to defeat Nazi Germany.

Students of Patton will find that this biography's broad strokes cover familiar ground, with new material highlighting interactions with individual Soldiers or revealing his private views on other general officers (most notably Eisenhower, Bradley and Clark).

Volume 1 starts with Patton's initial role as the commanding general of the Western Task Force during the United States' initial foray into the North African Theater during World War II. From there, Hymel takes the reader on a journey across Africa to the Allies' follow-on operation in Sicily before concluding with the D-Day landings and Patton's subsequent arrival to take charge of Third U.S. Army.

Operation Torch was America's first taste of ground combat in Africa and provided innumerable lessons-learned for the Army and Navy alike. While Patton was a seasoned veteran of the Mexican Expedition and World War I, these more recent experiences in North Africa and Sicily paid dividends in later operations across Western Europe. Similarly, Patton's performance demonstrated his leadership strengths and weaknesses while giving his superiors insights into some of the issues that ultimately led to his relief at war's end.

Throughout the work, Hymel shares Patton's accomplishments on the battlefield and failures with the press or with his own Soldiers in the infamous "slapping incidents" – underlined by his private thoughts on a myriad of subjects from his personal fears to insights on his comrades-in-arms.

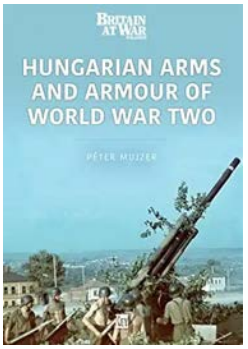
Patton's War is an exhaustively researched account but with enough errors to cause the reader distraction from an overall enjoyable book. Hymel includes many primary sources in his analysis, including Patton's own diaries, to develop a full portrait of Patton as a Soldier, diplomat and warrior. Many of these sources were previously unavailable to other authors, allowing some new ground to be covered and old conclusions from earlier biographies to be relooked.

Readers should anticipate a second and third volume in the set, although publication dates are pending.

LTC CHRIS HEATHERLY
U.S. Army Europe-Africa

Hungarian Arms and Armour of World War Two (Modern War series) by Peter Mujzer; Stamford, United Kingdom: Key Books; 2022; 96 pages; $18.99 Kindle, $24.41 paperback.

Most of our attention has been directed, rightly, toward the major combatants when studying World War II. We should not, however, neglect the smaller states. Their stories – in this case concerning Hungary's post-World War I rearmament and development of a domestic defense industry – can



serve as an example of regional power politics and the ability to adopt, adapt and develop organic means of military research, development and mass production under difficult circumstances.

This book serves as a brief case study of what a defeated nation, bent on reclaiming lost peoples and territories, can do despite treaty restrictions to reassert itself on the international stage. Hungary's "war within a war" in the Balkans and Eastern Europe also sheds light on the complexities of small-state relations and how their disputes can lead them to become embroiled in Great Power conflicts.

Finally, we can learn about the evolution of Hungarian armored forces as they progressed from purchasing from others to manufacturing foreign models under license to designing and building their own tanks for use in battle. Their path is one that other smaller powers have trod and continue to tread today.

Hungary entered World War I as part of the Austro-Hungarian "dual monarchy," with the Austrian kaiser also Hungary's king, theoretically a co-equal partnership and a major European power. It emerged from the ruins of war divided from Austria and from millions of ethnic Hungarians now living on the other side of the newly drawn borders of the successor states of their fallen empire. The interwar years were one continuous effort to hide what remained of their military strength from international inspection while finding the means to purchase newer and better equipment abroad.

Newly created independent Hungary inherited an officer corps, permitted and hidden military gear, doctrine and military culture from the old empire. These were the core components of their slow ascent toward military self-sufficiency. Peter Mujzer documents, with abundant photographic support, many aspects of Hungarian arms in action. The fruits of two decades' worth of effort were tested in battle – initially with neighbors whose lands and peoples that Hungary's regent, Admiral Miklós Horthy, and his government believed were rightly theirs – and later, first as Germany's ally in the Russian campaign, then as her satellite after secret negotiations to join the Allies were discovered and thwarted.

Hungarian soldiers fought with a mixed bag of Italian, German, Swedish and domestic armor, the latter including tanks such as the Turan and assault guns such as the Nimrud, that often held their own in battle with Russian troops in the early stages of the war. Both Turan and Nimrud were armed with Swedish Bofors 40mm cannon, manufactured domestically under license. Italian tankettes, of a kind already shown to be inferior during the Spanish Civil War, were shifted from the Army to police and border-guard duty in favor of Turans, Nimruds and other more capable vehicles. These in turn, late in the war, gave way to loaner German armor, initially panzer Mark IV tanks and Sturmgeschutz Mark III assault guns, with a few Tiger Is turning up toward the close of hostilities.

Mujzer's efforts encompass the full range of Hungarian arms and armor. While he devotes most of the book to tanks, artillery pieces and their prime movers – armored trains and other major systems – he also covers crew-served weapons and small arms. A fairly complete picture of all weaponry used by Hungarian troops in their border skirmishes with Romania, Yugoslavia and other neighbors, and later against the Soviet Union, emerges in less than 100 pages.

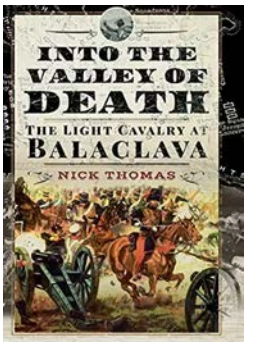
Though a small state, Hungary's ability to rearm after catastrophic defeat and dismemberment, in the face of treaty restrictions, international inspections, war debt and an austere economic situation is impressive. Drawing on centuries of military tradition, they set about the task they chose with effort and zeal, accomplishing much. The complex web of international direct purchases, license agreements and the genesis of their own modern defense-production capacity after evaluating foreign military equipment is a case study in what even a minor power is capable of when united and skillfully led.

The interlocking web of fraught relationships Hungary had with her neighbors is also an example of how small-state conflicts can influence the actions of major powers. This book should be of interest to anyone interested in this, as it is a treasure trove of often granular information for military history and armored-vehicle enthusiasts.

SFC (RETIRED) LLOYD A. CONWAY

Into the Valley of Death: The Light Cavalry at Balaclava by Nick Thomas; Havertown, PA: Pen and Sword Books; 2021; 357 pages, including appendices, endnotes, bibliography and index; $42.95 (hardcover).

Nick Thomas' ***Into the Valley of Death*** weaves together firsthand accounts to provide a detailed telling of the Charge of the Light Brigade during the Battle of Balaclava. While this battle is likely familiar to many because of Alfred, Lord Tennyson's poem, "The Charge of the Light Brigade," Thomas' book provides a riveting retelling of the fateful charge. Thomas puts the reader on the ground and in the action by telling the story with the words of the men who rode into that valley Oct. 25, 1854.



Into the Valley of Death centers on the events of the charge itself. Thomas opens with a brief overview of the Crimean War as well as the initial engagements between British and Russian forces. From there, Thomas quickly moves into the personal accounts of the charge. Readers move across the Valley of Death with the Light Brigade and charge headlong into the Russian guns. Thomas captures the confusion and disintegration of the brigade as the cavalrymen fight to secure the guns and are ultimately forced to retreat to British lines.

Thomas closes the main body of his

work by providing some conclusion to critical debates surrounding the Charge of the Light Brigade. His conclusions focus on the role of key players. He strives to highlight the confusion in orders between Field Marshal FitzRoy Somerset (1st Baron Raglan), the commander of British forces, and the commander of the cavalry, Field Marshal George Bingham (3rd Earl Lucan). Thomas also examines the poor working relationship between Lord Lucan and Lieutenant-General James Brudenell (7th Earl Cardigan), the commander of the Light Brigade. Lastly, Thomas looks at the often-debated impact of Captain Edward Nolan, the aide-de-camp who carried the orders that led to the ill-fated charge.

Beyond the narrative that Thomas constructed, ***Into the Valley of Death*** also provides multiple appendices that provide the reader with more detail. The appendices include the citations for medals received during the charge, full personal accounts and tables that account for each rider that took part in the charge. These appendices demonstrate the lengths Thomas went to build a narrative based upon firsthand accounts.

By far the greatest aspect of ***Into the Valley of Death*** is that it is built upon the firsthand accounts of the men who fought in the battle. Thomas laces together multiple perspectives so that the reader is fully emersed in the events. The reader feels the tension build as the brigade moves across the valley. The accounts capture the terror as man and horse are cut down by the Russian guns. Thomas' extensive use of these personal accounts truly brings the charge to life and provides readers with an accurate understanding of it. As mentioned previously, the author also includes an entire appendix dedicated to the full accounts of key personnel which provide the reader with further insight in the charge.

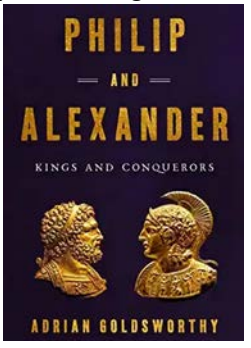
Readers should be aware that ***Into the Valley of Death*** only provides a brief overview of the events leading up to the charge. While it is helpful, it is likely not enough for readers unfamiliar with the Crimean War. Readers may find themselves overwhelmed by the speed with which events are covered in the overview. It will likely require readers to do more research outside the book to gain a solid understanding of the circumstances surrounding the battle itself. Further to this point, it would have been very beneficial for the book to include some maps to assist with the reader's understanding of the terrain and physical locations of critical events.

Into the Valley of Death is a worthwhile addition to any professional library. Although readers may need to research additional context to support their situational understanding, the telling of the charge itself is truly captivating. The personal accounts put the reader in the charge and among the guns. If a reader is looking for a work outside their normal reads, consider ***Into the Valley of Death*** to learn more about one of the most famous cavalry charges in history from the men who were there.

MAJ BRYCE W. EAST

Philip and Alexander: Kings and Conquerors by Adrian Goldsworthy; New York: Basic Books; 2020; 609 pages; hardcover $29.99, paperback $16.28, Kindle $19.99.

Alexander of Macedon earned his superlative for conquering much of what was, at the time, the known world. However, conquest alone was not his only mark of greatness. The attention Alexander paid to cataloging and maintaining his army's legacy included bringing historians with him on his campaigns.



After only two years as king, Alexander departed Macedon on an epic campaign to defeat the "king of kings" (Persian emperor) and found his own empire. The presence of dedicated historians on Alexander's campaigns help shine more fidelity on his reign than on his father's, King Philip II, but Adrian Goldsworthy's effort to piece together history allows modern readers a coherent understanding with input from all sources. Goldsworthy's academic contribution manages to offer a timeless theme both simultaneously unique and valuable in this era.

Philip's tireless efforts to build an army were what enabled the risk-seeking and adventurous Alexander to conquer the known world. This is the first demonstrated linkage of the framework and time required to build an expeditionary army.

Napoleon is supposed to have advised that those in the pursuit of becoming a "great captain of history" should "study over and over again the campaigns of Alexander," and he considered Alexander the first among the greats. What Napoleon shared with Alexander is not just cunning, boldness and a lifelong study of history, but they also both inherited an already well-seasoned army full of exceptional marshals who understood their profession.

Alexander achieved one of his early victories at Issus as his army unimaginatively but methodically advanced down a slope toward a river, all while adjusting their formations within sight of enemy forces. In other armies, what would be seen as marching into an enemy's engagement was actually Alexander employing the hallmark Macedonian discipline that Philip drilled into these men for a decade. Alexander's expeditionary phalanxes, and notably their training glidepath, would provide the framework for centuries of formations.

Another exceptional father who was overshadowed by his son was the "Soldier King," Frederick William I of Prussia, whose heir added enough exploits in the second Silesian War to earn his honorary title. Frederick the Great benefited from his father's obsessive drilling of his formations, whose lockstep marching in cadence with drums earned the Prussians a reputation for exacting automation. Without the well-developed discipline of this inherited army, it is likely Frederick would have been defeated many times over in the Seven Years' War.

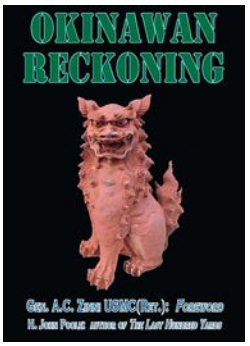
While Goldsworthy does not make this obvious connection, it is no coincidence that Frederick's continued exploits mirror those of Alexander's Persian conquests. Although likely

apocryphal, Diogenes' sifting through human bones to sarcastically say to Alexander that try as he might, he couldn't distinguish Philip's bones from that of a slave provides Goldsworthy a tried method of searching for reliable history in the graves of battle sites. Goldsworthy sifts through the inherent and often conflicting ambiguity of ancient history by focusing on actual battlefield locations to provide a chronological, combined narrative of this father-son duo that consequentially impacted world and military history as decisively as the army of Macedon did on the battlefield.

Goldsworthy's text should be required reading for students of military history that will benefit from discovering the inherent linkage between creating an expeditionary army that can be deployed decisively for extended campaigns.

CPT ZACHARY MATSON

Okinawan Reckoning by H. John Poole, foreword by retired GEN A.C. Zinni; Emerald Isle, NC: Posterity Press; 2022; 360 pages; $14.95 paperback.



John Poole has done it yet again. Reading Poole's books is a must for every tactician, and this is no exception. The latest in a long list of Poole classics focuses on the tactical aspects of the last World War II large-scale operation on Okinawa.

As with other books in Poole's growing repertoire, it is best if the reader has a little background in the history of maneuver warfare and the distinctions between the generations of warfare as described by William S. Lind in his 1989 ***Marine Corps Gazette*** article, "The Changing Face or War." Whether you support the concept or not, it is the basis of Poole's framework. It is helpful in fully understanding the lessons he derives from this classic 82-day battle and his comparisons between second- and third-generation warfare.

Within the pages of his latest endeavor, Poole dives into the Japanese defenders' effective use of micro-terrain to negate the United States' advantages in firepower. As with his other works, he weaves together a great deal of relevant research and historical analysis from many well-documented sources in a compelling instructional and thought-provoking narrative for the practitioner of warfare.

Ultimately it is the engagement that decides a battle that contributes to the campaigns and eventual achievement of identified objectives of a war. These engagements are determined at the squad, fire team and sometimes individual level, as proven many times throughout the Okinawa ordeal.

This book will provide small-unit leaders with excellent material for professional-development sessions with their Soldiers using a map to discuss actual events and possible solutions. However, most readers will benefit from a good Internet search for some more readable and detailed maps that are not as readily available within the book. Practitioners will find themselves poring over sections while referencing contour lines and locations on Okinawa to visualize the rich details within the pages. The microterrain-centric tactical level of the lessons require searching out a few good contour maps on-line at times to fully appreciate the lessons presented.

Okinawa Reckoning places yet another exclamation point on the detrimental effects overemphasis on long-range warfare has on recognition and investment in the short-range skills that infantry requires at the tactical level to compete with determined adversaries. Throughout the book, Poole reaffirms that Western affinity for firepower-centric second-generation warfare continues to hamper practical small-unit tactical proficiency. He continually asserts the supremacy of third-generation maneuver warfare as demonstrated by the Japanese on Okinawa as the preferred method of adversaries to counter this firepower approach.

Discovery learning during the conduct of warfare is a deadly method of teaching. Learning from historical examples compiled and critically analyzed by authors like Poole can greatly aid today's small-unit leaders in absorbing hard-won lessons from generations past. As with his other books, it is a must-read for the Soldier who wants to understand what it takes to fight and win at the individual and fire-team level.

LTC WILLIAM AULT

Armor in the Maritime Environment:
Lessons for Armor Employment from 1944 Leyte Campaign

by MAJ Matthew W. Graham

With the removal of tanks from the Marine Corps, the Army is now the sole provider of medium and heavy armor for the joint force. The definition of amphibious operations in Joint doctrine, and conceived of in the popular imagination, focuses on the landing operation. However, this limited focus runs contrary to the Army's historical experience of conducting significant land campaigns following its amphibious operations, and tanks play a major role in the success of those campaigns.

Department of Defense Directive 5100.01, ***Functions of the Department of Defense and Its Major Components***, currently appoints the Marine Corps as the Joint-force proponent for amphibious operations, but it also requires the U.S. Army to conduct amphibious operations.[1] However, since Korea, the Army has not conducted large-scale amphibious assaults involving armor. With the increasing focus of the Joint force on the Indo-Pacific, what lessons can the Army learn from past amphibious operations to best support future joint amphibious operations, especially regarding armor employment?

There are many historical examples that can provide insight into this, but perhaps the most insightful case study of the potential opportunities and risks of armor's use in a maritime-dominated multidomain environment is the campaign for Leyte in the Philippines archipelago in 1944.

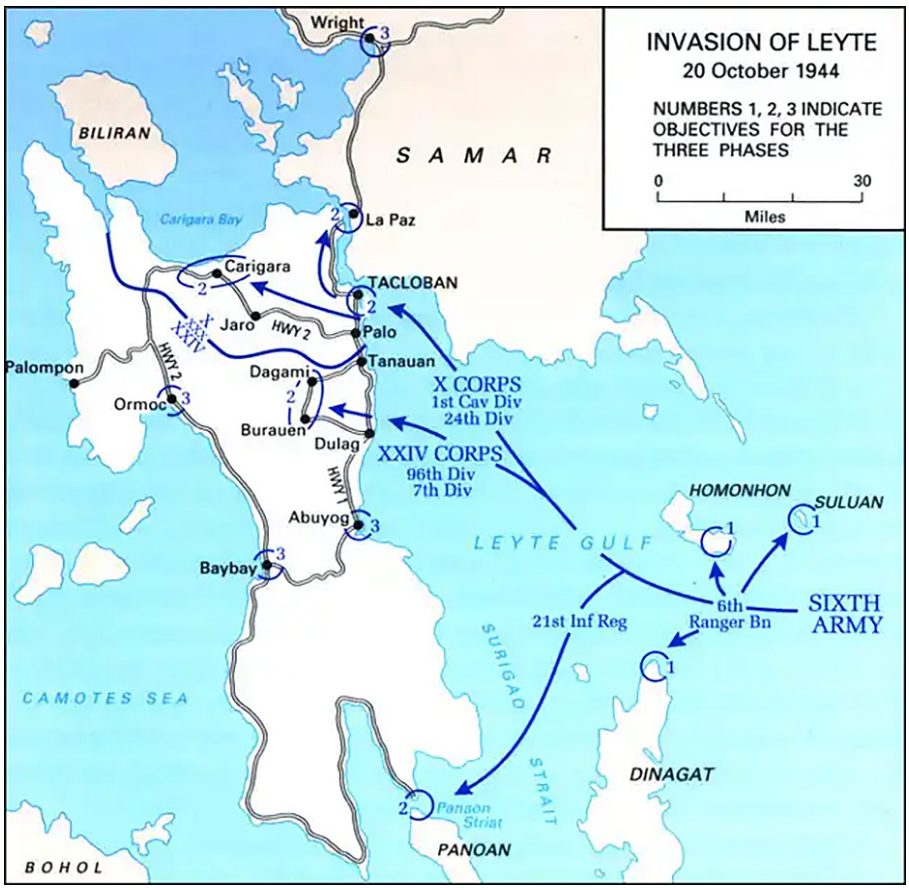


Figure 1. Invasion of Leyte Oct. 20, 1944. *(From the official history **U.S. Army Campaigns of World War II**; public domain)*

Operational context: Philippines and Leyte 1944

The operational objectives for the Leyte invasion were to seize several coastal airfields and port facilities to rapidly build up land-based air power to ensure air superiority over the surrounding area and thus allow the buildup of multidomain combat power in preparation for follow-on operations against the island of Luzon, home to the Philippine capital of Manila.[2]

GEN Walter Krueger, a veteran commander of Sixth Army in the Southwest Pacific, led more than 202,500 men in the invasion of Leyte.[3] Sixth Army organized its combat power into two corps, the X Corps (composed of 1st Cavalry Division and 24th Infantry Division) and XXIV Corps (composed of 96th Infantry Division and 7th Infantry Division).[4] U.S. Seventh Fleet, under the command of ADM Thomas Kinkaid, was in overall command of the naval elements supporting the landings with amphibious transport and indirect naval fires.

Leyte's terrain is formidable. Tropical coastal areas give way to steep jungle mountains in the interior. There were few roads on the island, thus restricting mounted maneuver to roads and their surrounding areas. Also, the weather would be a critical factor in the coming battle. Sporadic heavy rain and resulting mud would severely hamper the ability to get captured airfields into operation, impacting land-based airpower's ability to provide close air support and interdiction. Moreover, the emerging kamikaze threat kept most naval aviation focused on defending the fleet, further depriving the land forces on Leyte of supporting fires.[5]

Figure 2. Leyte topographical map. *(Courtesy of U.S. Army Center of Military History)*

Due to the rugged terrain, key terrain such as the city of Tacloban and the airfield at Dulag were located near the coast. Armored forces were well suited to advance from the beachhead, over relatively traversable terrain, and rapidly seize these objectives in the first hours and days of the invasion. While there are many examples of the opportunities and risks of armor employment in such a campaign, no two examples demonstrate the potential and challenges of armor use in the Indo-Pacific better than 767th Independent Tank Battalion's battles along the Dulag-Burauen-Dagami Road and at the stone bridge.

Battle of Dulag-Burauen-Dagami Road

The 767th was in bivouac Oct. 22, 1944, near the recently captured Dulag airstrip – about four miles from the initial landing beaches – while supporting 7th Infantry Division. LTC H.R. Edmondson, 767th's commander, received orders to support the assault of 17th Infantry Regiment (-) the next morning, Oct. 23, as part of a larger XXIV Corps attack west along the Dulag-Burauen Road to seize the towns of Burauen, San Pablo and their adjoining airstrips.[6] The 17th Infantry and 767th were to form the center of a division attack toward San Pablo. This attack was part of XXIV Corps' continuous advance west in coordination with 96th Infantry to the north.

MG John R. Hodge, XXIV Corps commander, prioritized the corps artillery fires to 7th Infantry Division and tasked them to make the "fullest use of tanks, field artillery, anti-aircraft guns, naval gunfire and aviation to support the advance."[7] Unfortunately only one of these elements, the tank, would be used during the initial advance.

Edmondson and staff received their mission briefing at 17th Infantry Regiment headquarters around 9 p.m. Returning to the battalion headquarters around 11:45 p.m., the commander and the S-3 devised a maneuver scheme that envisioned Companies A, B and C attacking abreast along a 400-yard-wide frontage west along the Dulag-Burauen Road, while 17th Infantry would follow and support. Company D, composed of M5 Stuart light tanks, would remain with the support elements as security at the bivouac area and provide convoy escort for any resupply convoys. The 767th Tank Battalion would commit more than 50 Sherman tanks to the attack, one of the largest tanks actions of the Pacific war.[8] The 767th and 17th would face elements of the Japanese 2nd Battalion, 20th Infantry Regiment, which had fallen back to hasty defensive positions around Burauen and San Pablo.

Figure 3. Tank 28, nicknamed Man of War, 767th Tank Battalion, advances west from the village of Jualita along the Dulag-Burauen-Dagami Road. The dual radios indicate a command tank.

At 6:30 a.m. Oct. 23, the 767th left its bivouac area and moved to attack positions near Moion, arriving around 7:40 a.m. At 8 a.m., the battalion crossed the line of departure and rapidly advanced along the Dulag-Burauen Road. Encountering sporadic but determined resistance, the battalion advanced the 3½ miles from its attack position to San Pablo in less than four hours, losing three tanks due to mines and Japanese satchel charges.[9] (In place of ranged anti-tank weapons, the Japanese employed suicidal satchel-charge-wielding infantry. While inherently hazardous to the attacker's well-being, this tactic would prove effective in the restricted terrain of Leyte, especially when tanks lacked infantry support.) Despite these losses, 767th rapidly advanced to San Pablo and Burauen, facilitated by the battalion's mass, firepower and shock effect.

Reaching San Pablo by 11 a.m. and capturing one of its accompanying airstrips by 11:30 a.m., the battalion halted to reorganize and resupply. However, the terrain over which the tanks had so rapidly advanced proved difficult for the infantry to cross, and there was a growing gap between the battalion and its supporting infantry. The 767th resumed its attack at 2 p.m. and advanced rapidly, encountering no enemy resistance as it quickly captured San Pablo airstrip No. 2 and advanced into Burauen, securing the west side of the village by 4 p.m. while encountering only sporadic sniper fire.[10] However, because of the infantry's inability to keep pace, 767th was ordered to withdraw two miles back to San Pablo to establish a bivouac.

This loss of ground would prove costly to the battalion the next day. At 8 p.m. Oct. 23, Edmondson received verbal orders from COL Francis Pachler, commander of 17th Infantry, to continue the attack toward Burauen the next morning, with the objective to secure the Buri airstrip and bridges over the Daguitan River. This would cause a change in the battalion battle plan. Company D, composed of M5 Stuart light tanks, would replace Company C on the main Dulag-Burauen Road. Company C would break off from the main battalion and reinforce infantry at the San Pablo airstrips and then move to capture the Buri airstrip in quick succession. Finally, Company B, operating on the north flank of the battalion's advance, would bypass the town of Burauen and attempt to envelop it from the north, eventually linking up with the main body via the Burauen-Dagami Road.[11]

At 8 a.m. Oct. 24, the battalion recommenced its attack, advancing rapidly west to the outskirts of Burauen. However, the surprise and shock effect of the previous day's attack had worn off and the Japanese were waiting. Starting around 10:30 a.m., several tanks in the main column struck mines,

resulting in one damaged tank blocking the road and halting the advance. This caused the remaining tanks to attempt a bypass by leaving the road, resulting in several becoming bogged down in thick mud.

By 11:30 a.m., the battalion's main advance into Burauen had stalled, while elements of Company B had encountered another minefield 500 to 600 yards northeast of Burauen. A strong Japanese defense around Burauen forced Company B to withdraw around 12:05 p.m. Burauen would not fall until elements of Companies G and F of 1st Battalion, 17th Infantry Regiment, arrived around 1:30 p.m. and cleared the town. Both elements of Company B and 17th Infantry continued actions about 500 yards north of Burauen until 5:30 p.m. with little effect.[12]

In total, the two-day battle of the Dulag-Burauen-Dagami Road cost the battalion nine M4 Sherman medium tanks, three M5 Stuart light tanks, two Soldiers killed in action, six wounded in action, the relief of the battalion commander and the end of conventional tank-battalion-level actions on Leyte.[13]

In the end, 17th Infantry Regiment failed to support 767th Tank Battalion with even a company of tank-mounted or mobile infantry during its initial attack, or to reinforce it rapidly once it had occupied Burauen. This fundamentally violated the principle of infantry-tank cooperation as laid out in Field Manual (FM) 17-36, ***Employment of Tanks with Infantry***, and resulted in the unnecessary battle Oct. 24.[14] This highlights the importance of tank-infantry cooperation while also demonstrating the potential of the tank to capitalize rapidly on mass, firepower and shock --- three qualities that can prove decisive, as seen Oct. 23, if armor is available during or following an amphibious landing.

With the capture of Burauen, although at a higher cost than necessary, XXIV Corps had partially achieved its A-day mission to seize the Dulga-Burauen area.[15]

Battle of stone bridge

On Oct. 28 17th Infantry Regiment continued its attack north toward Dagami. The unit encountered stiff enemy resistance about one mile south of the village, centered around a damaged stone bridge and adjoining wooden causeway crossing a stream, surrounded by swampy terrain.

Defenders from the Japanese 20th Infantry Regiment had built a formidable defense around the bridge about 1,000 yards south of Dagami, composed of mutually supporting pillboxes with interlocking fields of fire. The Japanese had also placed mines along the road leading into Dagami. These positions were located on high ground to the north of the bridge and had clear fields of fire across the length and width of the prepared engagement area. Japanese strength around the bridge was unknown, but in the greater surrounding area it was estimated to be anywhere from 1,500 to 2,500.[16]

The 767th, now in general support of 17th Infantry, was to provide one company of medium tanks for the coming assault.[17] Jumping off at 8 a.m. with 13 medium tanks, Company C encountered resistance as it crashed into Japanese lines. The tank battalion effectively applied direct fire and destroyed many pillboxes and fighting positions, while the attacking infantry worked its way along the road and through the adjoining swamps.

By 10 a.m., one platoon of tanks had been able to cross the bridge and adjoining causeway. However, the vehicles' weight had further damaged the structures, limiting the ability of other armored forces to cross until repairs were made.

With a platoon now north of the stream and cut off from supporting infantry, they became the focus of concentrated Japanese direct and indirect fire. By 11 a.m., a suicidal Japanese satchel charge had destroyed one tank while land mines disabled another two, leaving one of the tank crews, that of Tank C-44, trapped and surrounded in their disabled vehicle.[18] With supporting infantry pinned down by heavy Japanese machinegun and mortar fire, the attack was stalling.

However, the commitment of another infantry company – and the flanking of Japanese positions to the east by a section of M8 armored-gun carriers operating in support of Companies E and G, 17th Infantry Regiment – effectively suppressed the Japanese left flank and re-established fire superiority for the U.S. units. This enabled engineers to make necessary repairs to the bridges, allowing the remaining elements of Company C, 767th Tank Battalion, to move north of the bridge.

By 3:45 p.m., elements of Companies E and G had completed the destruction of the Japanese defenses' left flank. On the American left, more probing to the west and north by Companies C, F and B of 17th Infantry had located the enemy's right flank. With the support of a single medium tank, Company B, 2nd Battalion, 17th Infantry, was able to destroy pillboxes in this area and roll up the Japanese right. By 6:45 p.m. friendly forces finally reached the trapped crew of Tank C-44 and rescued them.

Having turned both flanks and penetrated the center of the enemy defensive line along the stone bridge, 17th Infantry went into defensive positions some 300 yards north of the bridge, while 767th's Company C withdrew to the regimental command post to reconsolidate.[19]

The breaking of the defensive line around the bridge enabled the capture of Dagami the next day, Oct. 29, and allowed the linkup between 7th and 96th Infantry divisions Oct. 30, thus solidifying XXIV Corps' front and securing X Corps' southern flank. The 767th would continue supporting 7th Infantry Division throughout the rest of the Leyte Campaign but mostly in section and platoon direct-fire support roles.

The combined-arms action at the bridge demonstrates the effectiveness of the tank-infantry team, even in highly restrictive terrain. The employment of armor in these scenarios, even in limited quantities, provides ready examples of armor's ability to capitalize on mobility and firepower to both enable maneuver and rapidly reduce enemy positions by direct fire. While the actions of 767th Tank Battalion between Oct. 17-30, 1944, represent the actions of only one tank unit of many involved in the campaign, it demonstrates the effects armor can achieve when employed and supported properly. The achievement of these effects would be impossible if tanks were not

part of the initial landing force or present in the follow-on waves of the amphibious operation.

The campaign on Leyte continued until Dec. 26 when GEN of the Army Douglass MacArthur declared operations complete.[20] Sixth Army, during the period between Oct. 20 and Dec. 26, 1944, suffered 2,888 killed and 9,858 wounded in action.[21] Japanese losses during this time are hard to determine, but Sixth Army estimated it had killed more than 56,000 Japanese troops and captured 392.[22] The use of armor on Leyte, even though in small numbers when compared to other campaigns, highlighted its usefulness and fulfillment of its doctrinal role. Without armor, it is doubtful that the land component of the Leyte Campaign would have successfully concluded in such a relatively short time.

Lessons observed, application of doctrine

Effective infantry-armor cooperation during amphibious operations was the single most important lesson of the Leyte operation. As noted in several after-action reports (AARs), two factors continually affected this coordination: infantry leaders' attitudes toward tanks and the level of tank-infantry training before the operation.[23]

As one infantry-battalion commander expressed, "From my experience, the use of tanks under extreme conditions of weather and areas of tropical vegetation is hardly worthwhile."[24] Opinions like this hint at a lack of understanding of the tank's capabilities and a clear lack of experience on how best to employ them.

The second issue was a lack of tanks-with-infantry training. The long distances and dispersed nature of the Pacific Theater limited the ability of units to conduct combined-arms rehearsals before operations. This severely impaired the development of mutual trust and understanding between infantry divisions and their assigned tank battalions.

As an example, the Leyte invasion fleet deployed from three departure points, each more than 1,200 miles from the invasion beaches at Leyte Gulf.[25] This dispersion of forces increased survivability but greatly limited the capability of units to train together before Leyte. However, some units did have experience and training at the division-level before departure for the theater.[26]

The battle of the stone bridge and the Dulag-Burauen-Dagami Road

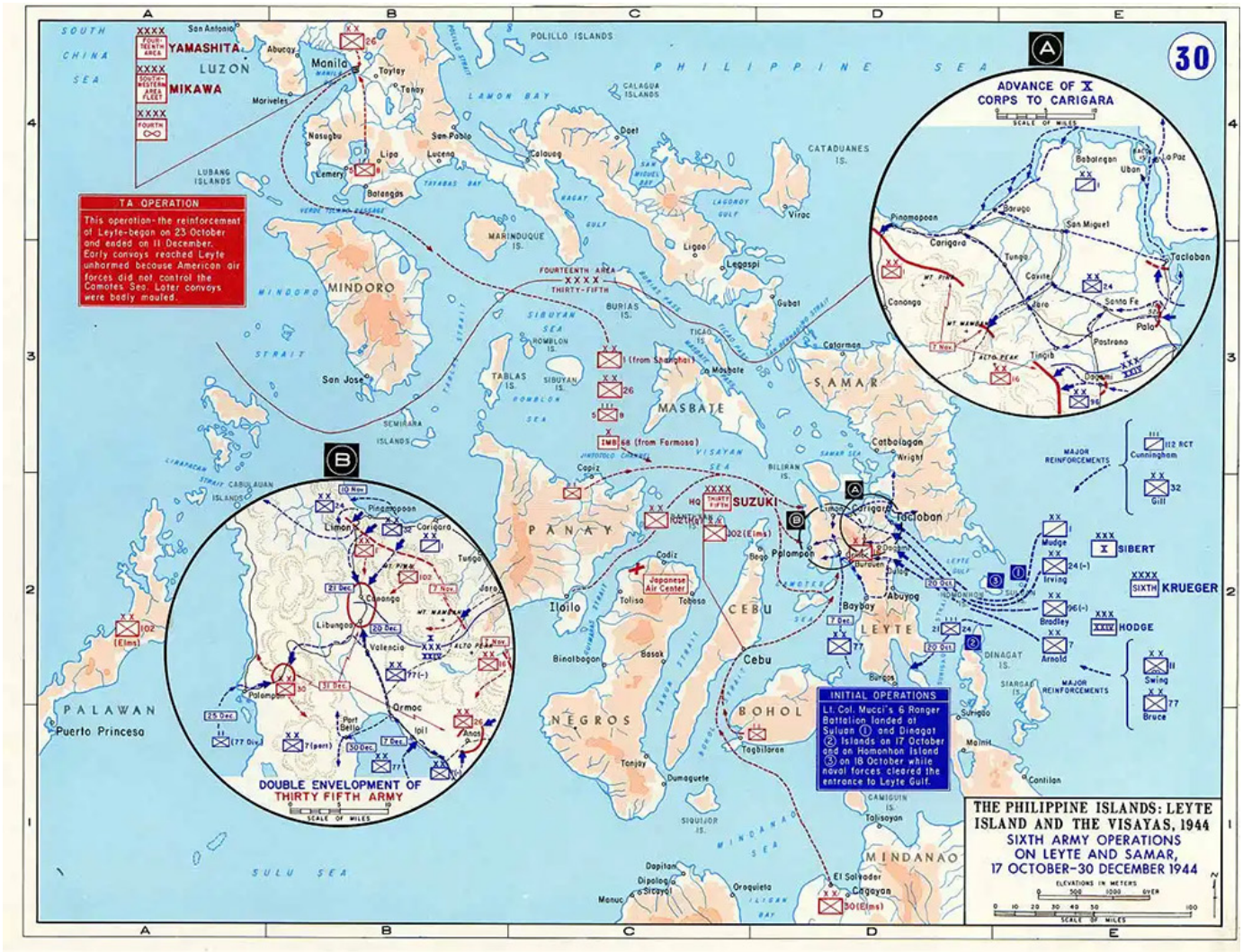


Figure 4. Sixth Army Operations on Leyte and Sambar, October-December 1944. *(Courtesy of U.S. Military Academy (West Point) Department of History)*

demonstrate the need for tanks during the land campaign that typically follows an amphibious assault. When weather, enemy action and other issues limit the application of both artillery and airpower, it falls to the infantrymen and tankers to accomplish the mission. The capability of armor to apply shock, mobility and firepower to an enemy enables the infantry to close with and destroy that enemy. Similarly, the infantry's ability to clear, hold and maneuver in very restrictive terrain protects the tank from enemy-infantry anti-tank weapons.

Both infantry and armor form a symbiotic relationship that produces the greatest effect on the enemy. As FM 17-36 stated: "Success in battle can be assured only when there is complete cooperation of all arms. No one arm wins battles. Success is attained when each arm, weapon and individual is employed to afford the maximum of support to the remainder integrated to achieve the enemy's destruction. Since tanks and infantry are linked so closely one to the other, it is necessary that the doctrine, powers and limitations of both be understood by all."[27]

At Leyte, the inability to develop land-based airpower and the Navy's commitment to a major engagement during the initial phases of the operation deprived the landing force of important air support. This increased the dependence on the other elements of the combined-arms team, including the tank. It is an interesting thought exercise to envision an amphibious operation on an island of similar size, such as Taiwan, occurring without tanks. One must wonder how successful and potentially costly such a campaign would be. It is without a doubt that the capability and willingness to deploy tanks during the initial phases of an amphibious assault in anticipation of the follow-on land campaign significantly contributed to the land victory on Leyte.

The Army should consider how the Marine Corps' recent removal of tanks will impact the Army's operational requirements in the Indo-Pacific in the future. Without a better understanding of lessons-learned in past Army amphibious operations and the role of armor within them, the Army will likely have to relearn these lessons at the cost of blood and treasure.

MAJ Matthew Graham is a student in the Advanced Military Studies Program, School of Advanced Military Studies, Fort Leavenworth, KS. His previous assignments include art-of-war scholar, U.S. Army Command and General Staff College (CGSC), Fort Leavenworth; readiness officer and operations officer, Human Resources Command G-3, Fort Knox, KY; commander, Headquarters and Headquarters Troop, 1st Squadron, 32nd Cavalry Regiment, 1st Brigade, 101st Airborne Divisions (Air Assault), Fort Campbell, KY; commander, Troop B, 1st Squadron, 32nd Cavalry Regiment, 1st Brigade, 101st Airborne Division, Fort Campbell; and executive officer, Troop C, 6th Squadron, 1st Cavalry Regiment, 1st Brigade, 1st Armored Division, Fort Bliss, TX. MAJ Graham's military schools include Basic Armor Officer Leader's Course, Scout Leader's Course, Reconnaissance and Surveillance Leader's Course, Ranger School, Pathfinder School; Maneuver Captain's Career Course, Air-Assault School, Cavalry Leader's Course and CGSC. He has a bachelor's of arts degree in international relations from the Virginia Military Institute, a master's of arts degree in defense and strategic studies from the University of Texas at El Paso, and a master's of arts degree in military arts and science from CGSC. MAJ Graham's awards include the Bronze Star Medal and the Meritorious Service Medal with oak-leaf cluster. He also holds the 6Z (strategist) and 5X (Army historian) additional-skill identifiers. MAJ Graham deployed in support of Operations Enduring Freedom (2012-2013) and Inherent Resolve (2019).

Notes

[1] Department of Defense Directive 5100.01, ***Functions of the Department of Defense and Its Major Components***, Washington, DC: Government Printing Office, 2020.

[2] General Staff, ***Reports of General MacArthur: The Campaigns of MacArthur in the Pacific Volume I***, Washington, DC: Government Printing Office, 1953; Sixth U.S. Army, "Report of the Luzon Campaign, 9 January 1945 - 30 June 1945," June 1945.

[3] Sixth U.S. Army.

[4] Ibid.

[5] Committee 16, Armored [sic] School, "Armor on Leyte, Sixth Army Operations, 17 Oct - 26 Dec 44," research report, Armored School, Fort Knox, KY, 1949 – World War II operational documents collection, hosted by Ike Skelton Combined Arms Research Library Digital Library.

[6] 767th Tank Battalion, "[AAR], 767th Tank Battalion, 23 October 44 thru 30 October 44; 1 January thru 31 December 44," World War II operational documents, Ike Skelton Combined Arms Research Library Digital Library.

[7] Headquarters XXIV Corps, "Operation Report, XXIV Corps, Leyte, 20 October 1944 - 25 December 1944," World War II operational documents, Ike Skelton Combined Arms Research Library Digital Library.

[8] 767th Tank Battalion AAR.

[9] Ibid.

[10] Ibid.

[11] Ibid.

[12] Headquarters 7th Infantry Division, "Operation Report, 7th Infantry Division King II."

[13] 767th Tank Battalion AAR.

[14] FM 17-36.

[15] Headquarters XXIV Corps operation report.

[16] M. Hamelin Cannon, ***Leyte: Return to the Philippines***, Washington, DC: Center for Military History, 1993.

[17] 767th Tank Battalion AAR.

[18] Ibid.

[19] Ibid.

[20] GEN of the Army Douglas MacArthur, ***Reminiscences*****,** New York: McGraw Hill, 1964.

[21] GEN Walter Krueger, ***From Down Under to Nippon***, Zenger Publishing Company Inc., June 1, 1979. First published 1953. Note: Kruger further stated that non-battle-related casualties were much higher.

[22] Japanese numbers are hard to pin down. Japanese total losses, including air and naval loss, are estimated to 59,400 or about 1/5 of the Japanese forces in the Philippines. For more detailed information on Japanese and American casualties' numbers see Cannon's ***Leyte: Return to the Philippines***.

[23] Committee 16.

[24] Ibid.

[25] Daniel E. Barbey, ***MacArthur's Amphibious Navy***, Naval Institute Press, January 1969.

[26] Sixth U.S. Army report of the Luzon Campaign. Of note: 7th Infantry and 1st Cavalry had prior combat experience. The

7th Infantry and 96th Infantry Divisions both conducted full-dress practice landings on Maui, Hawaiian Territory, in September 1944. However, these landings did not cover actions inland, instead focusing on the assault landing only.

[27] FM 17-36.

Acronym Quick-Scan

AAR – after-action report
CGSC – Command and General Staff College
FM – field manual

63RD ARMOR REGIMENT

Green is used for Armor. The wavy band is from the arms of the Rheinprovinz and indicates service in that area and in Central Europe, while the fleur-de-lis is for service in France and the citation for Colleville. The rampant lion from the arms of Belgium represents the citation for Mons Eupen-Malmedy. The canton represents descent from 745th Tank Battalion, from which these honors were inherited, seven being represented by the septfoil, four by the square and five by the star.

The distinctive unit insignia was approved Dec. 4, 1964.

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PB 17-22-4
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