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HARMON
Unleashing the Leviathan:
Transforming the ABCT to Win in LSCO

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Fall 2025, Vol. CXXXVII, No. 3

Departments

1 **Contacts**

4 **Chief of Armor's Hatch:**
BG Chad C. Chalfont

5 **Gunner's Seat:**
CSM Ryan W. Roush

6 **From the Boresight Line: Enhancing Combat Effectiveness: Implementation of Collective Scanning Techniques**
SFC Jesse R. Craven

8 **From The Combat Training Centers: Reconnaissance and Security After ARSTRUC: Cavalry Squadrons are out but R&S are Still in!**
LTC James Carrier, CPT Mike Christy, CPT Mike McKeon, and COL CJ Kirkpatrick

13 **From the Tower: TC 3-20.31-120, Gunnery: Heavy Tank Tower Prompts**
Weapons and Gunnery Branch

54 **Book Reviews**

55 **SGT Fred Benning**

Features

15 **Unleashing the Leviathan: Transforming the ABCT to Win in LSCO**
LTC Christopher Hanes and LTC Larry Kay

19 **AFN-OTM: Enabling Distributed Operations at the Tactical Level**
LTC Marreo Burch, MAJ Adam Black, and CW2 Justin Carrier

22 **Breaking Through: Combined Arms Maneuver Against Prepared Defenses**
LTC Darrell Fawley

27 **General Abrams's Impact on Modern Armored Warfare and the M1 Legacy**
SGM Steve Gonzalez

32 **The 10X Tank Platoon**
Ted Maciuba

39 **Transformation on the Frontier's Edge: 2CR's Once and Future Legacy**
MAJ Andrew Kang and MAJ Michael R. Nilsen

43 **Interwar Mechanization to Transformative Robotization**
Kasey O'Donnell

47 **Combined Arms in Urban Operations: Insights into ATP 3-06.11**
CPT Logan S. Yates

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BG Chad C. Chalfont
Chief of Armor/Commandant
U.S Armor School/
Director Next Generation Combat Team Cross Functional Team

Driving Change: Armor Brigade Combat Team Transformation

In this article, I'd like to briefly describe our ongoing efforts to transform the Armored Brigade Combat Team. There is little uncertainty about the need to adapt how we organize, equip, and train our armored formations. Over the last several years, articles in this publication have (rightly) highlighted the key features of today's and future battlefields, where our formations will operate under conditions of constant observation, greater lethality, and with greater frontages and depths. We are driving action today to make our formations more lethal, more survivable, and ready for the next fight. The remainder of this article outlines what we are doing over the next twelve to eighteen months to transform the ABCT.

Transformation in Contact (TiC) 2.0 answers this question: how can we rapidly adapt our formations to make them more lethal, with the capabilities and technologies available today? To do this, the Army has focused on two levers: the infusion of technology directly into our tactical units and adapting the organizational design of these same formations. The Army has designated two pairs of ABCTs as TiC ABCTs: 2/1 CD and 2/3 ID (with NTC rotations in Fall 2025 and early Summer 2026, respectively) and 1/1 CD and 2/3 ID (with NTC rotations in 2027). All four of these ABCTs will be fielded with a range of materiel capabilities for their home station training and NTC rotations. These technology infusions focus on improving the ABCT's ability to sense, strike, protect, and conduct command and control.

Each of these ABCTs will also experiment with organizational design changes that will increase the fighting capability of their formations. Key formations under consideration include the 1) Multi-Functional Reconnaissance Company (brigade-level sense and strike arm); 2) the multi-Purpose Company (battalion-level sense and strike arm); and 3) the Armored Strike Platoon (ASP). The ASP is a battalion-echelon specialty platoon that employs air and ground unmanned systems. Put another way, the ASP serves as the landing spot for unmanned systems as they are fielded to the ABCT.

Finally, our branch will drive action and collaboration on ABCT TiC 2.0 efforts using the Armored Transformation and Standardization Initiative (ATSI). Over the past year, the ATSI has focused on creating, developing, and enforcing the Armor Force's training standards. Over the next twelve months, the ATSI will expand its scope to address ABCT transformation. In addition to pursuing training standards, our monthly ATSI councils will now include opportunities for leader dialogue/collaboration and drive on priorities of work necessary for near-term transformation of our ABCTs.

Even as our mounted formations drive change through Transformation in Contact, our community must continue to invest in reinforcing our training standards. Examples of ongoing ATSI efforts include: 1) establishing UAS, C-UAS, and emissions control training standards for our tactical units and our doctrine; 2) implementing the Maintenance Skills Test to reinforce crew-level maintenance proficiency; 3) implementing our new gunnery standards for the Abrams and Bradley platforms; 4) continuing the 1st Cavalry Division pilot of the Standardized Armored Based of Training (SABOT) program; 5) receiving feedback from the field on doctrine development efforts; and 6) improving tank and Bradley field-level maintenance training proficiency.

This is truly an eventful time in the Armored Force and across the US Army as we drive Continuous Transformation. The Armor School is always ready to partner with you as you drive readiness and work towards transforming our formations. And as always, if you need anything from the Armor School, just holler!

Forge the Thunderbolt!

FROM THE GUNNER'S SEAT

CSM Ryan W. Roush
Command Sergeant Major
U.S. Army Armor School

New Armor School CSM and Focus Areas

I assumed the position as the Armor School Command Sergeant Major (CSM) at the beginning of July and I am extremely humbled and excited for this new role. Following the footsteps of CSM Petty and other legends across our branch is an absolute honor and I am thankful for this privilege. I am grateful for this opportunity and want to thank CSM Petty for all his hard work and would like to wish him and his family the best as he continues to lead in our Army.

This is my first time stationed at Fort Benning and even though I am new here to the community it truly feels like I am home. Some of the best leaders I know also serve here and every day feels like a mini reunion as I reunite with Armor Leaders and Soldiers from across the force. I can honestly say that the Armor School is in good capable hands with the talent we have assembled, and you can trust that the Army put the right leaders here to train our force.

As I assume this role, BG Chalfont empowered me with assisting him with his priorities as we provide the best training for the armored force. A priority for both of us is to ensure we are communicating our initiatives with the force in a consistent manner, there should be no secrets to what we are doing here, and we are all in this together. Throughout my time here I plan to be directly tied in with our Division and ABCT CSMs as well as our nominative leaders across the force and I look forward to working with all of you.

As I contemplated my role as the Armor School Command Sergeant Major, the primary thought remains focused on what the Branch needs the most: dominant leaders in our formations. The leaders that take charge of every situation, that execute their mission violently, they own their battlespace, they are the leaders that are relied upon to lead our Soldiers in combat. When we think of these leaders, they all have different strengths, competencies and attributes, but one thing that sets them apart is their technical and tactical competencies. I believe it is our task here at the armor school to deliver the most trained, lethal and competent soldiers and leaders to your formations. Our leaders should trust that when they receive a Soldier from us, or they send a leader to one of our functional or institutional courses, they leave better than when they came. That they have the skills and knowledge to accomplish their missions and lead their Soldiers.

An immediate priority is to continue our efforts in our Abrams and Bradley master gunner program to ensure we are getting the right MG candidates into school with the right allocations across the force to ensure we are building lethality in our formations. Our goal is to produce as many highly qualified and trained master gunners each year as allocations will allow. We are looking at ways we can gain proficiency in our teaching methods and how we keep the right people on track as they attend MGPAC at home station and continue to learn the necessary skills to make them lethal.

I have begun to look at our competitions SOP as we begin planning for the 2026 Sullivan Cup. My goal is to ensure we are executing the best competition to select our most lethal tank and BFV crews. In doing this, we ensure this competition tests crews on our standards as well as creates challenging head-to-head competitions in all aspects of lethality. The competition must also showcase the best range capabilities that the Army has to offer. Sullivan Cup 2026 is set for the first week of May, and units should receive invitations later this fall. I look forward to seeing all our lethal crews and units represented.

Once again, I am very excited to serve as the Armor School CSM, and I look forward to hearing from everyone. Thank you all for what you do every day, for your commitment to our Soldiers and our profession.

Treat 'em Rough! Scouts Out!

Forge the Thunderbolt!

Enhancing Combat Effectiveness:

Implementation of Collective Scanning Techniques

by SFC Jesse R. Craven

Armored vehicles are crucial to modern warfare, providing ground forces with mobility, protection, and firepower. Central to their effectiveness is the utilization of advanced optics that enable crewmembers to gather critical information about their surroundings, identify potential threats, and make informed decisions. Understanding scanning techniques and detection principles is vital for maximizing crew abilities and enhancing the combat effectiveness of armored vehicles across the force.

Situational awareness is central to combat effectiveness. While operating inside of an armored vehicle, crewmembers must rely on external optics to gain a picture of the world outside. These external viewing optics may have effective magnification and thermal imaging, but they are limited by their field of view. Effective scanning techniques are essential for understanding the entire battlefield. By continuously scanning their surroundings, crews can detect enemy positions, monitor friendly forces, and identify key terrain features. Scanning is a systematic approach to observe designated areas or an assigned sector. Five detection methods can identify potential threat locations: rapid, slow, horizontal, vertical, and detailed.[1] Small units or crews employ multiple scan and search methods simultaneously, varying them to maximize threat acquisition. Crewmembers should start with a rapid scan of the sector to identify irregularities. If an irregularity is detected, a more refined search or deliberate observation of the area is necessary.

Note: Soldiers scanning for aircraft may miss targets in the lower portion of their sector if they look too high above the horizon. The correct upper limit is 20 degrees.[2]

Detecting threats is paramount and requires utilizing available sensors, optics, and systems. Identifying potential threats quickly allows friendly forces to respond effectively. Crewmembers must learn optimal techniques to enhance target detection.

Today's battlefield presents various threats, but our primary concerns remain enemy combatants, hostile vehicles, and unmanned aerial vehicles. Thermal imaging systems detect heat signatures associated with threats, but scanning techniques empower armored crews to identify these threats and take proactive measures to neutralize or avoid danger. An effective search is a systematic approach that allows crews to apply their individual scan methods collectively. The primary goal of collective searching is to eliminate dead space and unobserved areas, maximizing crew threat detection capabilities. By applying collective scanning techniques, crewmembers effectively mitigate threats over a wider area of operation.

Three basic techniques are used for collective searching by small units or crews: overlapping sectors, dividing sectors, and sectors in depth (near or far).[3] Units may combine all three techniques into their threat detection procedures if necessary. Some threats are harder to detect than others. Soldiers must be well trained to detect and locate targets, including understanding detection challenges and how to overcome them. Overcoming detection challenges slows the target detection process, regardless of training level. Soldiers must understand why these challenges occur and how to overcome them. Difficult targets include small or single targets in complex environments, camouflaged targets, and peripheral targets (targets on the edge of the field of view). Challenges include observer's physical deficiencies (fatigue) or significant environmental changes (mirage or fog). Some of these challenges are overcome through training while others are overcome through recognition and planning.[4]

Threat detection is a critical skill, whether Soldiers are dismounted or mounted. It requires thoughtful application of available sensors, optics, and systems. Quickly and effectively finding potential threats maximizes the time friendly forces have to defeat them. An initial scan can be done with the naked eye, but Soldiers familiarize themselves with the best practices for target detection using advanced optics.

The key aspect of combat

Figure 1. U.S. Army SGT Chris Flores, left, and Jordan Byington, both assigned to 1st Battalion, 64th Armor Regiment, 3rd Infantry Division, operate a Bradley Fighting Vehicle at Fort Stewart, GA. *(U.S. Army photo by PFC Benjamin Hale)*

effectiveness is the ability to accurately acquire and engage targets with precision and speed. Scanning techniques play a pivotal role in this process by enabling crewmembers to identify and track enemy forces. Forward-looking infrared (FLIR) cameras provide enhanced target discrimination capabilities, allowing crews to differentiate between combatants and non-combatants. Additionally, laser rangefinders and ballistic computers facilitate precise weapon aiming, increasing the probability of successful engagements. Once a possible threat is detected in a general area during the search, crews must rapidly acquire the actual threat. Soldiers should employ all available assets and options to facilitate rapid target acquisition. To accomplish this, adequate training must be allotted for sight adjustment and range finding techniques. The complexity of the switches on crewmember's hand stations and sight control panels can hinder maximizing platform capabilities.

Current optics, thermals, sensors, and illuminators compound threat detection challenges by how they function. It is important leaders and Soldiers are extremely familiar with their assigned optics and which stimulant they are capable of detecting. This includes their ability to manipulate the optic's controls, switching between wide field of view (WFOV) and narrow field of view (NFOV), and transitioning between thermal and image intensifier (I2) optics. This builds Soldier proficiency in employing multiple sensors or optics to detect threats efficiently within their sector, as rapidly and accurately as possible.[5]

Scanning techniques and target detection principles are pivotal to enhancing the combat effectiveness of armored vehicles across the fighting force. When applied correctly, these techniques and principles allow small units and crews to maintain situational awareness and detect/acquire targets with precision. They empower crews to confidently and accurately navigate the complexities of the modern battlefield. As technology progresses, optics will assume a more prominent role in battlefield development. Units must invest substantial time and resources in training crewmembers to optimally utilize advance vehicle optics. This proactive approach ensures armored formations retain their position of advantage on the forefront of combat capability and remain prepared to confront the evolving challenges of future conflicts.

Sergeant First Class Jesse R. Craven currently serves as a Senior Instructor of the Bradley Master Gunner School, 3rd Squadron, 16th Cavalry Regiment at Fort Benning, Georgia, following previous roles as an Instructor within the same school, Brigade Master Gunner for the 174th Infantry Brigade in Fort Dix, New Jersey, Platoon Sergeant and Squadron (MG) with 4th Squadron, 10th Cavalry Squadron in Fort Carson, Colorado, and as a Section Leader with 1st Squadron, 4th Cavalry Squadron in Fort Riley, Kansas. SFC Craven holds an associates degree in Military History from American Military University and has completed extensive military training including Master Gunner, Sniper, and various leadership courses, alongside five deployments with four combat tours to Iraq, Afghanistan, Jordan, and Saudi Arabia. SFC Craven is a highly decorated Soldier recognized with two Meritorious Service Medals, twelve Army Commendation Medals, six Army Achievement Medals, two Military Outstanding Volunteer Service Medals, and earning the Combat Action Badge, Master Gunner Identification Badge, and Expert Marksmanship Badge.

Notes

1. U.S. Department of the Army, Training Circular 3-20.31-4, October 2024, https://rdl.train.army.mil/catalog-ws/view/100.ATSC/754BB14F-0662-4A69-9C25-78713EF98F0C-1729556078743/TC3_20x31_043.pdf.

2 Ibid

3 Ibid

4 Ibid

5 Ibid

FROM THE COMBAT TRAINING CENTERS

Reconnaissance and Security After ARSTRUC:
Cavalry Squadrons are out, but R&S are Still in!

by LTC James Carrier, CPT Mike Christy, CPT Mike McKeon, and COL CJ Kirkpatrick

Besides having some of the most complex terrain with the most variable weather conditions at any of the CTCs, JMRC has the unique opportunity to routinely train with Infantry, Mobile, Stryker, Armor, and Multinational Brigades. As the new Army Structure (ARSTRUC) is implemented across the force with multiple functional and organizational changes for all formations, consistent trends in reconnaissance and security challenges are evident. Understanding reconnaissance and security as tasks that enable specific purposes for the brigade combat team (BCT) remains critical and has only gotten more challenging as we integrate new technology into our own force while in contact with near peer capabilities. The tools are changing, but the fundamentals of reconnaissance and security remain reliable guideposts for planning, resourcing, and executing these critical tasks. The institutional Army – particularly the Maneuver Center of Excellence – and our CTCs remain the premier venues to adapt to these changes and train the force on reconnaissance and security.

Death,Taxes, and R&S Are Eternal

The Battle of Arracourt, fought in September 1944 between the US Army's 4th Infantry Division and the German 5th Panzer Army, highlighted the critical importance of ground reconnaissance particularly when conditions were not ideal for collection via aerial means. During the battle, environmental conditions consisting of dense fog and poor weather limited American aircraft from providing aerial reconnaissance and close air support necessitating the commander's reliance on ground-based reconnaissance assets to track German formations. Despite adverse weather conditions and visibility, these ground-based assets provided timely and accurate intelligence allowing US forces to set up a well-coordinated defensive position. The Americans destroyed dozens of German tanks and halted their offensive, resulting in a decisive American victory.

In 2016, after the reflagging of the Army's last Armored Cavalry Regiment in 2011, US Army Forces Command (FORSCOM) directed the 1st Stryker brigade combat team (SBCT), 4th Infantry Division to conduct a study to determine the feasibility of a SBCT effectively conducting reconnaissance and security (R&S) tasks in support of a Division or Corps. Although this study was conducted at a higher echelon, a key finding resonates in the post-ARSTRUC era:

"Perhaps the most important lesson we learned is the tradecraft of R&S is difficult to master for both the individual and the organization. True expertise requires a career of focused study and attention. The complexity of R&S missions only increases as one moves from platoon up through the echelons to BCT-level operations. The achievement and preservation of mastery takes generations to build and can be lost in a decade or less. Regardless of the organizational design the Army ultimately decides, it is our position that the Army should maintain at least one or more brigade-sized combat formations with the primary mission to fight for information. We cannot wait to build this expertise after a crisis arises."

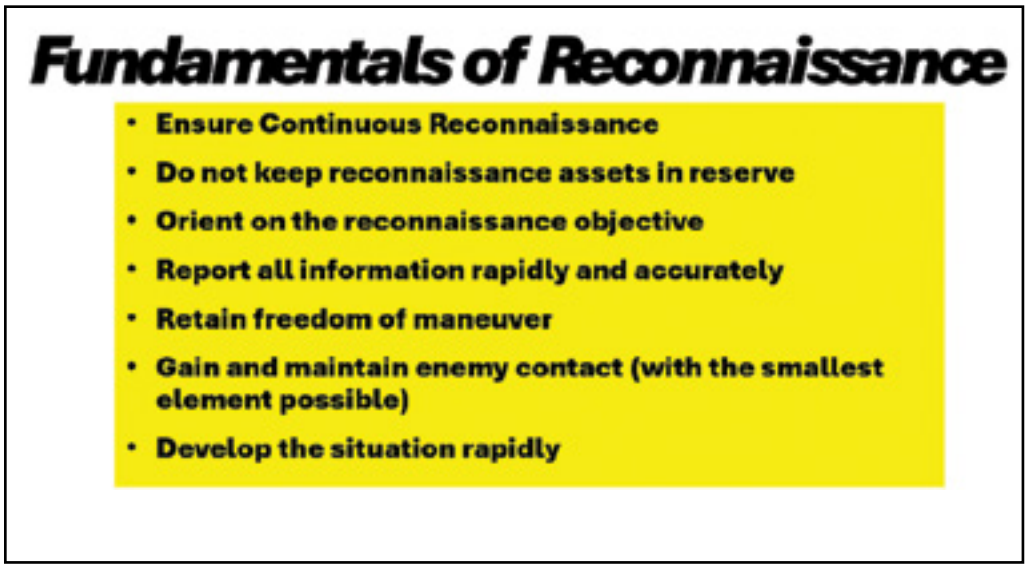

Figure 1. Fundamentals of reconnaissance *(Image by author)*

This article is not a call for the return of the Cavalry Squadron. We as a force have acknowledged the need for a leaner Army; however, the requirement to conduct R&S still exists. The advent of new and more sophisticated tools such as unmanned aerial systems (UAS), unmanned ground vehicles (UGV), enhanced electronic warfare (EW), extended lethality, and artificial intelligence enhanced mission command systems all make the BCT exponentially faster, more lethal, and more survivable. But only if BCTs apply new tools appropriately to deliver reconnaissance and security for the formation to enable the main effort and accomplish the mission.

The Fundamentals are Fundamental

According to FM 3-98 "reconnaissance is a mission to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or adversary, or to secure data concerning the… characteristics of a particular area." Whether pushing, pulling, mounted, dismounted, conducting aerial, or recon by fire reconnaissance, the fundamentals of reconnaissance have guided the basic employment of forces to obtain information critical to mission success.

Crucial to employment of these fundamentals is the basic elements of command reconnaissance guidance. Commanders – at a minimum – must articulate reconnaissance focus, tempo of reconnaissance, engagement/disengagement criteria, and displacement criteria to drive reconnaissance success.

According to ADP 3-90, security is a distinct and separate requirement for a BCT, where "the main difference between conducting security operations and reconnaissance is that security operations orient on the force or facility being protected while reconnaissance orients on the enemy and terrain." The tactical tasks of screen, guard, and cover are often loosely used to describe a mission requirement to orient on the protected entity to provide space, time, and early warning to allow the commander to achieve the primary end state desired. Once again, our fundamentals have reliably guided the employment of forces to achieve a security end state that enable the main effort.

Observations from all the CTCs consistently highlight challenges in providing clear command guidance to enable effective R&S operations; timely military decision making process (MDMP) that allows R&S forces sufficient space and time to achieve commander's intent; a lack of a synchronized or integrated information collection plan to enable mixing and cueing of capabilities; and insufficient resources applied to solve the tactical problem presented. So what's new that's worth mentioning?

Those previous observations were enduring with each BCT formation arriving at a CTC with a purpose built organization trained specifically in R&S tasks. With the implementation of the ARSTRUC, JMRC observer controller/trainer (OC/Ts) are seeing these same trends defined in new ways. BCTs continue to struggle with the most commonly observed trends but that struggle is compounded by new challenges. BCTs now have a knowledge gap in the formation, are hard-pressed to allocate sufficient combat power to achieve desired R&S outcomes, all while having too many new technological tools that

Figure 2. Fundamentals of Security *(Image by author)*

can do too many things.

Emerging Trends: Someone Has To Do R&S

As BCTs fully reorganize in accordance with the ARSTRUC a knowledge gap is emerging that challenges formations to effectively develop the battlefield. BCTs continue to execute effective intelligence preparation of the operational environment (IPOE) to provide a detailed evaluation of the threat and terrain. Visualization tools are allowing BCTs to build more sophisticated enemy event templates that visualize the enemy in space, time, and terrain.

These tools should drive effective information collection planning as units exit mission analysis and continue towards course of action development. The information collection synchronization matrix (ICSM) is the key warfighting product that synchronizes collection assets in time and space against both priority and target intelligence requirements and should be a key output of mission analysis. But too often the ICSM does not account for the limitations of new forms of reconnaissance and security. For example, ICSMs consistently reflect medium and long range reconnaissance unmanned aerial system (UAS) as 24/7 all-weather sensors. All systems observed at JMRC have limitations dictated by the complex terrain and often punishing weather conditions that inhibit advertised performance. For example, temperatures dropping below zero reduced the battery performance to less than 67% of the Motorized Rifle Regiment (MRR) platform's advertised capability during rotations in the winter. Finally, operator fatigue, coupled with rest and security plan requirements, prevents units from executing their planned collection. In lieu of 24/7, all-weather assets, the brigade information collection (IC) manager must completely understand asset capabilities and deliberately schedule their use over named areas of interest (NAIs) to meet the priority intelligence requirements.

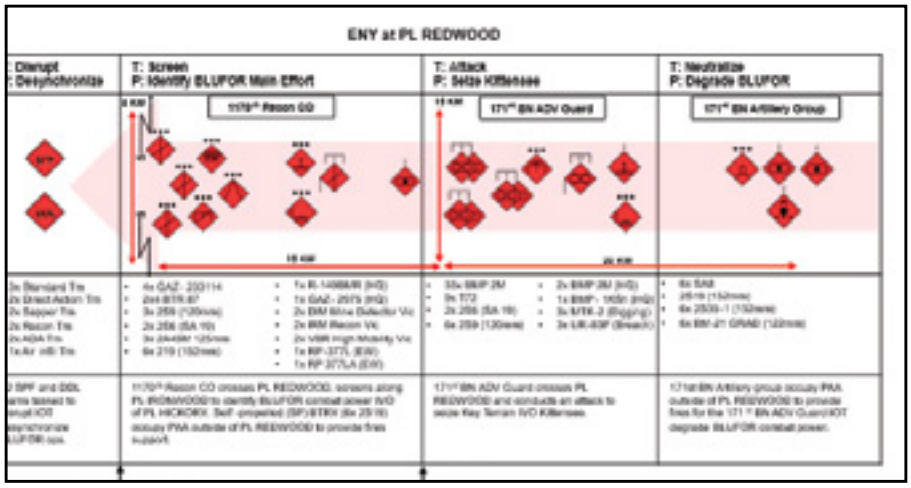

Figure 3. Enemy at Phase Line Redwood *(Image provided by author)*

Further complicating R&S planning is the multitude of things UAS and other capabilities can do but cannot do all at once. Developing the situation, confirming or denying the enemy most likely versus most dangerous, developing targets, and assessing effects are all essential tasks. But UAS are limited in number, flight time, and field of view. They cannot do all these things at once or even in close sequence. UAS operators and collection managers must maintain a clear understanding of what is the most important requirement at any given time and remain disciplined in employment of assets. This does not mean strict obedience to the plan, but it does mean a full understanding and adherence to the commander's intent as outlined in the reconnaissance or security guidance.

Without a dedicated ground R&S unit, a detailed IC plan is essential to provide situational understanding and targeting. The reorganized BCTs must execute routine assessments of IC after each key event on the event template to determine the performance and effectiveness of assets in collecting priority intelligence requirements (PIR) while identifying areas for improvement. These assessments should be completed by the brigade R&S cell, which should flatten the planning considerations of fires, information collection, and reconnaissance/security. The brigade R&S cell should oversee these assessments and feed into the continuous updating of IPOE, the IC plan, and the brigade's targeting cycle. ABCTs are part of this dialogue as well – the incorporation of UAS, EW, and UGVs in the armor formation presents new challenges in maintaining tempo even with the retention of the cavalry squadron.

The information collection plan outlined in Annex L is the foundational product that drives the scheme of maneuver of any unit tasked with R&S. As an enabling task executed on behalf of the brigade, the R&S unit's planner, S3, and/or commander should integrate into the brigade's planning process, greatly facilitating parallel planning at the battalion level. As a best practice, the brigade commander and R&S unit commander conduct an R&S huddle as part of the mission analysis process. The R&S huddle is the initial dialogue between commanders to develop commander's reconnaissance and security guidance, proposed commander's critical information requirements (CCIRs), identification of R&S objectives, and addition of battalion assets to the brigade information collection plan. Key to successful R&S operations is a synchronized plan that meets brigade requirements, not a stand-alone battalion R&S plan independent of the brigade's plan.

It is imperative that the commander's R&S guidance from this huddle be published in the brigade's warning order (WARNORD) #2 under the execution paragraph. This will allow battalion planners to stay within the commander's visualization for the

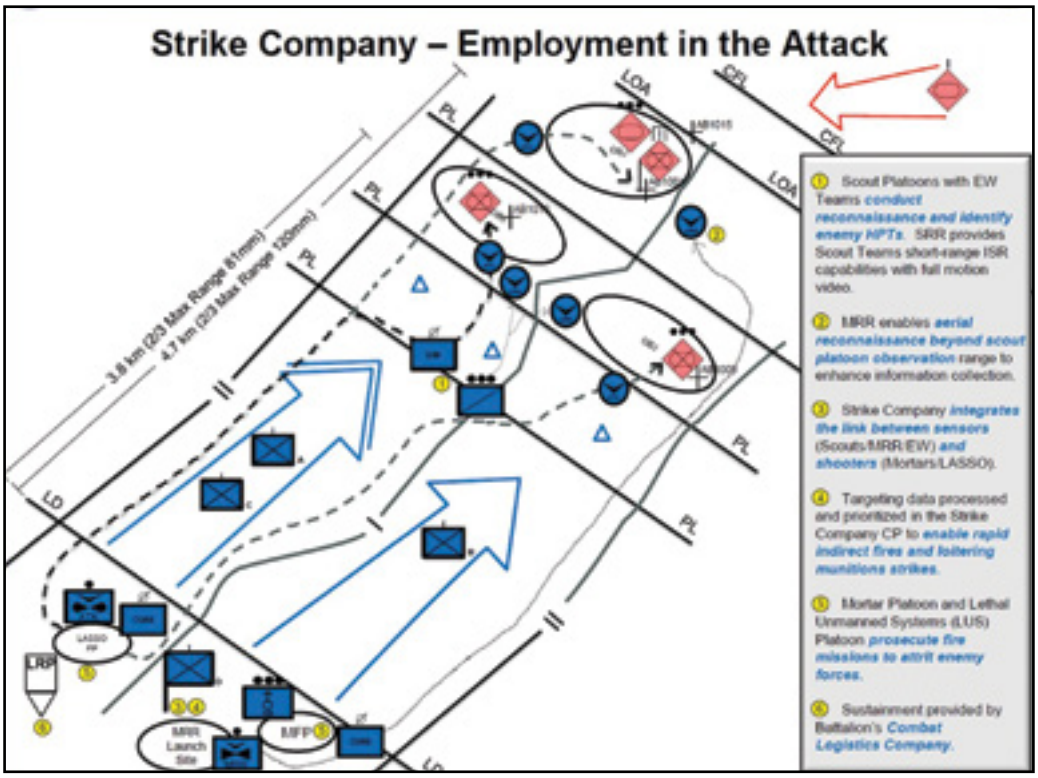

Figure 4: Strike Company Employment in the Attack *(Image provided by author)*

reconnaissance and security mission. This will ensure that the light brigade combat team (LBCT) R&S unit collect and report only the most important information in a timely and effective manner.

Multi-Functional or Multi-Purpose Reconnaissance Best Practices

The US Army has intentionally not defined the task and purpose of the new multi-purpose company, leaving brigade's ability to develop their own doctrinal templates (DOCTEMP) on their employment that will eventually inform future doctrine. Mobile and Stryker brigade combat teams continue to experiment with a mix of organizations and technologies to fill the gap left with the loss of cavalry squadrons. A decrement of TOW/ITAS and Javelins with the deletion of the cavalry squadrons plus the loss of the weapons companies challenges BCTs' ability to apply lethality forward to establish effective security or fight for information.

Multi-function organizations that combine UAS, Low Altitude Stalking and Strike Ordnance (LASSO), EW, mortars, and traditional scout platoons at the brigade and battalion level offer capability that answer some of the fundamental R&S challenges that must be addressed, but their purpose remains vague. Are they R&S elements? Are they more aligned to the fires war fighting function, focused on the "battalion and brigade deep fight? Do they focus on supporting companies in the close fight? Do they develop targets as part of the kill web? The answer is probably – all of the above.

The multi-function concept is intended to provide a flexible and adaptable force that can perform a variety of tasks, including reconnaissance, security, and targeting while also supporting the maneuver of the rifle companies. Gaps in the doctrine, organization, training, materiel, leadership and education, policy, facilities (DOTMLPF) framework and implementation of this multi-functionality leads to brigades interpreting their employment in their own way. However these organizations are employed, the key to the unit's success will be the early integration of the multi-functional unit commanders into the higher headquarters' MDMP as the executor of the battalion and brigade's tactical enabling tasks. Commanders at echelon must still provide reconnaissance and security guidance, employment of IC assets in time and space, determine priorities of fires, the high payoff target list, the attack guidance matrix, and target selection standards. Subordinate multi-functional commanders must understand how to employ their capabilities within the framework of these products to enable the ground tactical plan.

Where to Go From Here?

The great news as the Army continues to transform is that our R&S fundamentals are still sound principles to guide planning and execution, regardless of the new tools and organizations we are developing. The Maneuver Center of Excellence (MCOE) has some of the answers. The Cavalry Leader Course (CLC), Scout Leader Course (SLC), and Reconnaissance and Surveillance Leader Course (RSLC) are all grounded in the fundamentals. As new tactics, techniques, and procedures emerge we must continue to update our programs of instruction to provide the premier institutional education the force needs to solve old R&S problems with new tools.

All brigades must take advantage of that learning opportunity. Talent management is more important than ever to thoughtfully develop the key skills, knowledge, and attributes for key leaders in multi-functional organizations. Brigade commanders will ask these organizations to help solve the R&S problem at echelon – they must train them accordingly. Plan ahead to send and graduate the right leaders from key schools to lead new capability. If brigades want leaders who can leverage multi-functional capability to establish security or conduct reconnaissance, they better ensure those leaders understand the fundamentals. The tools

are changing, but the fundamentals still work as a heuristic to understand planning and execution towards an end state.

As a profession we must continue to have flat and honest dialogue to share best – and worst – practices as we transform. The strength of our profession and our Army is our ability to learn through effective after action reviews and professional dialogue. Every brigade is rapidly learning. Flat communications and brutal honesty ensure we don't learn the same things over and over.

Last but not least, our combat training centers continue to be the Army's learning laboratory. All the CTCs are modernizing and transforming along with the Army to remain the premier locations to bring new ideas and methods to test in simulated combat. Our opposing force (OPFOR) remain devious, innovating at the same pace as our BCTs to provide the most realistic near-peer threat to challenge units to the brink of failure. We all remain the U.S. Army's first battlefield for the force, where Soldiers and leaders can come sweat and cry in their first battle so they don't bleed and die in their second.

TRAIN TO WIN!

From the *ARMOR* art archives

"Thunder Run"

Lieutenant Colonel James P. Carrier currently serves as a Senior Cavalry Trainer at the Joint Multinational Readiness Center (JMRC) in Hohenfels, Germany. Prior to this assignment, LTC Carrier commanded 5th Squadron, 1st Cavalry Regiment at Fort Wainwright, Alaska, and served as the Professor of Military Science at St. Bonaventure University in New York. LTC Carrier's previous key roles include serving as the Brigade Executive Officer Observer, Coach, Trainer (XO OCT) at JMRC, the Brigade S3 for 2nd Stryker Brigade Combat Team, 2nd Infantry Division at Joint Base Lewis-McChord, Washington, and the Squadron S3 for 8th Squadron, 1st Cavalry Regiment, also at Joint Base Lewis-McChord. He is a graduate of the Intermediate Level Education at the Command and General Staff College, Fort Leavenworth, Kansas, as well as the Maneuver Captain's Career Course and Armor Officer's Basic Course at Fort Knox, Kentucky. LTC Carrier holds a Master of Science in Administration from Central Michigan University and a Bachelor of Science in Engineering from Michigan State University.

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TC 3-20.31-120, Gunnery: **Heavy Tank**

Tower Prompts

by Weapons and Gunnery Branch

This is the second article covering the changes to the gunnery manual, Training Circular (TC) 3-20.31-120, awaiting publication this fiscal year (FY). This second article discusses the why and how of tower prompts. They are a large portion of each engagement with examples of the tower prompts for each engagement.

With the new engagement layout including prescriptive target types, postures, range bands, and firing vehicle posture, the gunnery manual can now provide an example script for the Master Gunner for each engagement that completes three functions:

- Establishes the actions required of the crew to prepare for the engagement.
- A collective fire command following TC 3-20.31-043, *Conduct of Fire,* October 2024.
- Reinforces the process found in TC 3-20.31-040, *Direct Fire Kill Chain*.

Figure 1 provides an example within the Heavy Tank gunnery manual for engagement 65, *Change of Weapon / Ammunition*, with both the script to preapare crew for the engagement as well as the prompt for the execution of the engagement.

In the preparation for the engagement section, the tower provides the administrative information to the crew. This includes any administrative movement to a battle position or firing box start point, and includes the appropriate battlecarry ammunition type required. For those chemical, biological, radiological, and nuclear (CBRN) engagements, it will include any masking instructions.

Once those instructions are acknowledged and executed, the tank commander should inform the tower they are set by announcing "REDCON ONE," or readiness condition one. From this point the crew owns the engagement except for catastrophic engine or thermal optic failure at no fault of the crew.

The prompt from the crew is provided as an example. Units don't have to follow these examples at all. They are provided to show what is expected as a collective fire command. The administrative information plus the tower prompt's collective fire command provide all the information the crew needs to know about the conditions of the engagement.

ALERT – the alert element is the notional senior leader calling the vehicle.

WEAPON / AMMUNITION – in this example, the battlecarry information from the administrative commands provided the default ammunition or weapon. In doing so, the weapon / ammunition element is omitted.

TARGET DESCRIPTION – the specific targets in order or priority are described to the crew. In this example, the troops are the most dangerous of the initial presentation (the first two targets of the four-target presentation).

METHOD – although this may be omitted in the fire command, the senior leader elected to define the method of engagement as "MOST DANGEROUS FIRST." If the crew fires at the least dangerous first it does NOT instigate a

crew penalty. The engagement times will automatically penalize a crew for killing a least dangerous target first.

LOCATION – these engagements are prescriptive in nature with a proofed, standardized scenario. The Master Gunner must provide the nearest target reference point, terrain feature or other identifying graphic control measure that orients the crew in the general direction of the threats during the initial presentation. For gunnery, this is required information provided to the crew to ensure consistency and standardization across all training crews.

RANGE – this is optional to the tower prompt. If the Master Gunner or scenario developer deems it necessary for effective training, they must provide the information equally to all crews.

CONTROLS – generally, this is a standard statement where the tank commander is required to positively identify the threat prior to issuing the command of execution. This is a fratricide prevention and range safety function and not just "phrases to say."

EXECUTION – the collective fire command permits the crew to engage once the controls are met by announcing the weapons control status for all weapons. In this case, announcing **"*WEAPONS FREE*"** has a distinct meaning tied to TC 3-20.31-040, *Direct Fire Kill Chain*, where the target is not positively identified as friendly. This is the second fratricide prevention measure integrated into the tower prompt.

Note – the targets should not be presented (step execution) immediately after the execution, the tower prompt provides some time for the tank commander to digest the information and prepare for the engagement. It is followed by an additional control.

CONTROLS – specifies the actions to take once the Tank Commander determines the desired effects are achieved against the threat. In this example, including "***REPORT WHEN SECTOR CLEAR***" serves to remind the crew to check their work. Master Gunners may alter this control for engagement with targets on delay versus engagements without delay targets for clarity.

The tower prompts are a vital component of each engagement. They establish the conditions of the task at hand, prepare the crews correctly with the appropriate battlecarry information, establish the default firer and weapon / ammunition, describe the initial presentation, and set appropriate controls to the engagement for force protection / fratricide prevention and standardization of the engagement. It is tied to TC 3-20.31-043, *Conduct of Fire*, and TC 3-20.31-040, *Direct Fire Kill Chain*. It serves to reinforce the standards in those publications to build better understanding and provides "what right looks like" during crew training.

FIRE, FIRE SABOT

In the next article, we will discuss Table C, *Complex Engagements*, why they are complex, what Master Gunners need to pay attention to, and things the crews need to know to be successful at those complex engagements.

65

TARGET 1	TARGET 2	TARGET 3	TARGET 4
CHANGE OF WEAPON / AMMUNITION DEFENSE			

ENGAGEMENT AMMUNITION REQUIREMENTS

KE	MPAT	CAN	7.62mm	CAL .50	HOSTILE FIRE	STEEL ON STEEL
CA69	CA31	CA38	AB86	A557	LA54	LA53
3	1.5		50		3	3

PREPARE FOR ENGAGEMENT

_____ THIS IS _____

PREPARE FOR DEFENSIVE OPERATIONS IN BATTLE POSITION _____

BATTLECARRY MPAT, PREPARE SABOT, AND CHECK YOUR MACHINE GUNS. REPORT REDCON ONE, OVER.

PROMPT

ALERT	_____ THIS IS _____
WEAPON / AMMO	
TARGET DESCRIPTION	TROOPS AND PC, TANK AND MOVING TANK IN SUPPORT
METHOD	MOST DANGEROUS FIRST
LOCATION	VICINITY _____ AND _____
RANGE	
CONTROLS	ENGAGE UPON POSITIVE IDENTIFICATION
EXECUTION	WEAPONS FREE, WEAPONS FREE.
CONTROLS	REPORT WHEN SECTOR CLEAR, OVER.

Figure 1. Engagement 65 ammunition, preparation for the engagement and tower prompt.

Unleashing the Leviathan:
Transforming the ABCT to Win in LSCO

U.S. Army photo by 1LT Kimberly Blair

"If you want to break a country, and you want to change the course of history, then you send a heavy division."[1]

by LTC Christopher Hanes and LTC Larry Kay

The changing character of warfare necessitates a reevaluation of the armored brigade combat team (ABCT). Recent conflicts in Azerbaijan, Ukraine, and Israel demonstrate the rapid evolution of combat characterized by technological advancements, increased lethality of precision-guided munitions, and the prolific use of unmanned systems and cyber capabilities. These conflicts raise concerns about the dominance of heavy armor in environments where mobility, adaptability, and integration of advanced technologies are paramount. To maintain battlefield relevance, the ABCT must adapt and undergo structural alterations, which enhance its agility, endurance, and depth in multi-domain operations. Among the most urgent alterations are strengthening maneuver capabilities, increasing organic indirect firepower, thoroughly integrating autonomous systems, and creating a durable communications network.

Strong Maneuver Capabilities Facilitate Endurance

The strength of the ABCT depends on the strength of the armored cavalry squadron (ACS). The ACS currently consists of three cavalry troops and one armor company. The armor company can function as an independent formation but is often task organized by platoon to the cavalry troops. Organizing the armor with the cavalry troops enable a hunter/killer configuration. The use of the armor in this formation facilitates effective execution of the commander's engagement criteria without immediately unmasking the scouts. However, this configuration creates command and control issues, because these teams are rarely tested during training, leading to mission command and sustainment issues. Additionally, a consequence of this configuration is that the armor company commander (in the ACS) loses all combat power, becoming a hollow company. Subsequently, cavalry troops should be assigned one armor platoon permanently. Two scout platoons and one armor platoon per cavalry troop places firepower where it is needed and facilitates effective training and team building prior to execution. Unlike the original organization of the Stryker Brigade Combat Team (SBCT) in which a Mobile Gun System (MGS) platoon, led by an armor lieutenant, was assigned to an infantry company, the cavalry troop commander can properly train and develop the armor platoon leader as a future armor or cavalry officer.

Prudent commanders maintain a tactical reserve to reinforce; to add depth; to block penetrations; to counterattack; and to seize and exploit the initiative. Currently, ABCT commanders must subtract combat power from one of the combined arms battalions to source a reserve company 'out of hide'. Subtracting this company from a combined arms battalion disrupts teams who have trained to fight together and lessens the combat power required to accomplish the battalion mission. Additionally, whatever company is selected to be the BCT reserve is rarely trained to be a reserve, is likely unaware of the planning considerations, and forced to coordinate support outside its parent battalion. Unlike in counterinsurgency operations, the reserve is more likely to be used to exploit an advantage or defeat a penetration, postured in a position of advantage. To remedy this, the ABCT should have an additional armor company added to the BCT by way of the modified table of organization and equipmen (MTOE). This armor company should primarily consist of fourteen tanks and have very few enablers allowing it to maneuver rapidly and

"As the ranges of our artillery systems increase and the battlefield becomes deeper, the tank-infantry team in that last mile of combat and in the final hundred yards will be more dependent, not less, on mortars for their indirect fire support."[4]

decisively. This company should consist of the best and most experienced tankers in the BCT and be led by a second-time company commander who can operate audaciously and independently.

In 2014, when BCTs received a third maneuver battalion, combined arms battalions (CAB) lost a company.[2] They became either CAB-As (Armor), which consist of two armor companies and one mechanized infantry company, or CAB-Is (Infantry), which consist of two mechanized infantry companies and one armor company. This off-balanced and fragile organization hindered the CAB from moving with the speed and lethality for which it was intended. Furthermore, at its core, the current formation works against three of the four tenets of multidomain operations.[3] Combined arms battalion commanders cannot fully task-organize into company teams and must reduce their favorable force ratios to constitute a reserve at the battalion level, which is nearly always required by both doctrine and the environment. This organization imposes a dilemma on the commander by forcing them to make task organization choices they would not have had to make in the former organization of two armor companies and two mechanized infantry companies. Finally, infantry squads in the ABCT enable the speed and lethality of the ABCT by providing security to the main body, defeating threats in restricted terrain, and assaulting trenches and small urban areas which are inevitable in large-scale combat operations (LSCO). To increase lethality, we must restructure the ACS and return to the previous CAB task organization. In doing so, the ABCT will possess the ability to endure and overwhelmingly defeat the enemy.

Close Fight Agility Through Indirect Firepower

In ABCTs, there is a gap between the effects placed by a company and those placed by the brigade and the division. This is due, in part, to the division becoming the primary tactical warfighting headquarters and recent changes arising from the Army Structure (ARSTRUC)[5]. Subsequently, the artillery battalion, which previously belonged to the BCT commander, will more than likely support the division artillery's mission to prosecute targets directed by the commanding general, leaving the ABCT without organically controlled artillery. This means ABCTs do not have the weaponry required to prosecute targets greater than a battalion's 120mm mortar systems and less than the artillery supporting the division's targeting, which creates a gap between echelons.

For the ABCT of the future, the 120mm mortar is increasingly important. Future 120mm mortar carriers must be enclosed to provide protection to the crew and be capable of firing on the move. The enemy will focus fires on mortar systems in the close fight and evidence from the current conflict in Ukraine suggests artillery fragments are the predominant cause of casualties.[6] There are large caliber mortar systems currently available which meet these criteria, including an Armored Multi-Purpose Vehicle (AMPV) variant with the Patria NEMO (from "NEw MOrtar") remote-controlled turret. This system enables simultaneous, multi-round, fire missions in less than four seconds while the vehicle is stationary or on the move. Future mortar systems must work in conjunction with unmanned aerial systems (UAS) for targeting. Direct coordination between UAS and mortars provides greater options to the command by reducing fire response times and increasing accuracy.

Indeed, future mortar platoons must also have Low Altitude Stalking and Strike Ordnance (LASSO) - which is a man-portable, tube launched, lethal

Figure 1. A M2 Bradley and M1A2 Abrams from B Troop 3-116 Cavalry Brigade Combat Team during JRTC rotation 24-09 at Fort Polk, LA. *(U.S. Army National Guard photo by MAJ Gregory Walsh)*

"Integrated formations will bring robotic systems into units alongside humans, with the goal of always having robots, not soldiers, make first contact with the enemy."[9]

payload munition, UAS - or for ease of discussion, a loitering munition. The 44-day war between Armenia and Azerbaijan in 2020 demonstrated the devastating effect of loitering munitions by destroying heavy ground units, including T-72 tanks and advanced S-300 air defenses.[7]

LASSO should be organic to each mortar section within the brigade. Co-locating LASSO with mortar platoons allows for command and control of the munitions through the mortar section sergeant and integrates them into the battalion fire support plan. In the ACS, the LASSO can be integrated to provide depth for security operations by identifying and destroying armored threats beyond direct fire distances or screening the flanks of the squadron. Additionally, placing LASSO within CABs will provide a tremendous advantage in engagement area development, allowing the battalion to destroy armor threats before unmasking and revealing its battle positions.

The ABCT requires rapid and overwhelming lethality in the close fight. As artillery, rockets, and attack aviation shape the division's deep fight, commanders in the close fight require a platform that can integrate with UAS to defeat high payoff targets. A multi-mission launcher (MML) section carries fifteen Hellfire (or future equivalent) missiles. Using laser designators or drones, Soldiers can identify and destroy targets well beyond the forward edge of the battle area (FEBA).[8] This capability would enable the ABCT commander to impose his will in the close fight. The MML would also reduce the strain on attack aviation by minimizing the need for commanders to request their effects in the close fight, thus allowing the attack aviation to place greater effects in the deep area.

Figure 2. The Multi-Mission Launcher meets major milestone with tests in 2017.

Echelonment of Unmanned Reconnaissance

The Robotics Autonomous Systems (RAS) Platoon will achieve the Secretary of the Army's intent. To best ensure that robots make first contact and provide early warning, the ABCT should contain at minimum three RAS platoons. RAS platoons should be assigned to each cavalry troop. Conceptually, the armored cavalry troop will consist of one RAS platoon, two scout platoons, one tank platoon, a mortar section, and a headquarters section. The inclusion of this capability will enable the ACS to conduct a guard against an armored adversary.

The Medium Range Reconnaissance (MRR) (Group 2 UAS) drones of the RAS are vitally important to ABCT's success. The MRR will identify targets and relay the target location to mortars, cannon artillery, and rockets. Additionally, the MRR must be fitted with laser designators for Hellfire remote missions to the MML. As the enemy approaches the FEBA, first contact robots and drones will gain and maintain initial contact with the enemy and provide firing solutions to an array of capabilities available to the commander. The idea being that enemy attrition is achieved by robots before they reach friendly battle positions, allowing for a desirable force ratio.

To complement the MRR, the ABCT also requires a long-range reconnaissance (LRR) platoon. The LRR platoon will be used to map the area ahead of the brigade, identifying suspected enemy positions using multispectral technology. Multispectral imaging shows greater promise in detecting camouflaged positions than rudimentary visual or thermal imaging.[10] Anything with a spectral signature that appears anomalous with respect to their current context, i.e. a camo net or camouflaged vehicle tucked into natural vegetation, will stick out. Detection results should be available almost immediately, allowing an intel analyst to define enemy positions. The BCT's drones, loitering munitions, mortars, and MML can target these positions to set conditions for the brigade transition into the offense.

Convergence Requires Communication

Communicating on the modern battlefield presents significant challenges. The proliferation of advanced technologies, such as cyber warfare, electronic jamming, and the widespread use of unmanned systems complicates traditional communication methods. Recent conflicts in Ukraine, Azerbaijan, and Israel continue to highlight the vulnerability of communication networks to disruption, interception, and manipulation, underscoring the critical need for resilient, adaptable, and secure communication systems. As adversaries become more adept at targeting communication networks, the ability to maintain command and control, situational awareness, and cohesive operations is at risk, demanding innovative solutions that can withstand the threats of future warfare.

ABCTs must be able to communicate beyond line-of-sight without emitting noticeable electromagnetic signatures or being jammed. Current FM communications produce large electromagnetic emissions when used improperly and often require large antennas that are detectable and slow to displace. Satellite communications like tactical

satellite (TACSAT), Joint Battle Command-Platform (JBCP), and Warfighter Information Network – Tactical (WIN-T) are all vulnerable to jamming. Both forms of communication share a common vulnerability in that they use centralized hubs.

ABCTs should immediately integrate all communications into a mesh network. Mesh networks solve the issue because they do not require a central communications hub. Wireless radio devices, housed in any asset whether it be a Soldier, vehicle, or drone, automatically locate one another and establish a data network. Data transmissions hop from one unit to another, maintaining signal strength. Line of sight is not required, so even if nodes are located behind a hill or within a building, units can still receive signals that have been relayed through other wireless nodes. Distribution of the communications load across multiple nodes reduces the need for high power transmissions from a single point, therefore minimizing the overall electromagnetic footprint. Integrating mesh networks enables the ABCT to facilitate convergence at the decisive point and dominate the close fight.

In conclusion, we must transform the ABCT to the leviathan it was intended to be. To ensure the ABCT can dominate the close fight, it must be able to identify and prosecute its own targets, gain and maintain contact with autonomous systems, and communicate in a manner that produces a low signature. To do this, the ABCT's maneuver forces must be strengthened to ensure it overwhelms enemy forces with unmatched speed, lethality, and flexibility. The ABCT must also be equipped and thoroughly integrated with autonomous systems, sensors, and strike capabilities allowing it to detect and deliver lethal effects in the close area and up to the division's deep area. Additionally, the ABCT must increase its organic indirect firepower and create a durable communications network that enables it to move at the lethal speed as it was intended. To their benefit in future conflicts, our enemies are currently discovering their innovation imperatives through many successes and failures. While we remain largely unengaged, we must likewise learn from their successes and failures. It is extremely important and existentially necessary that we transform the ABCT whilst we remain unengaged in large-scale ground combat operations.

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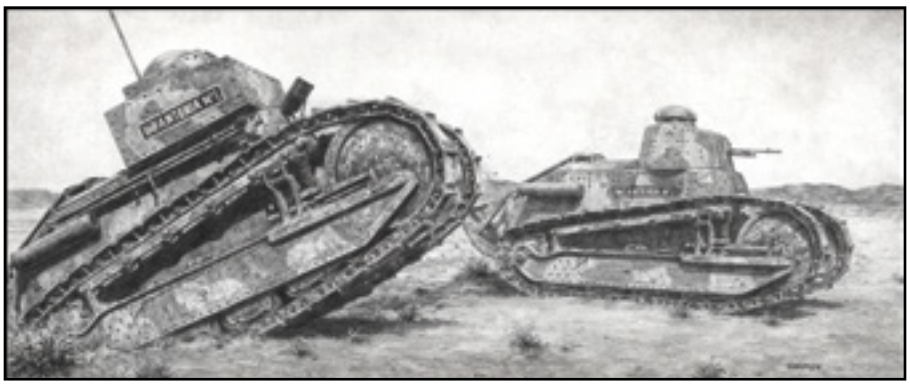
Lieutenant Colonel Larry Kay currently commands 2nd Battalion, 54th Infantry Regiment in Fort Benning, GA. Before command, LTC Kay was the Assistant Chief of Staff – G5, Chief of Plans of 3rd Infantry Division. LTC Kay was also the Deputy Chief of Staff of 4th Infantry Division, 1st Infantry Division, and 3rd Infantry Division. LTC Kay is a graduate of the School of Advanced Military Studies' Advanced Military Studies Program. LTC Kay authored numerous articles including, "Lessons from LSCO, parts 1-3," which can be found in From The Green Notebook & "Putting the Enemy Between a Rock and a Hard Place: Multidomain Operations in Practice," with the Modern War Institute.



From the *ARMOR* art archives

"Tank Warfare During the Rif Rebellion"

Notes

1 Major General Charles Norrie, attributed to the hammer of the 18th Airborne Corps, the 3d Infantry Division.

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AFN-OTM: Enabling Distributed Operations at the Tactical Level

U.S. Army photo by MAJ Carson Petry

by LTC Marreo Burch, MAJ Adam Black, and CW2 Justin Carrier

Note: This article first appeared in the Spring 2025 issue of Army Communicator.

In March of 2024, U.S. Army Forces Command (FORSCOM) Headquarters (HQ) tasked the 1st Infantry Division (1ID) Headquarters (HQ) to execute the Armored Formation Network On-The-Move (AFN-OTM) Pilot II with 1ID and 1st Brigade Combat Team, 1ID, at Fort Irwin, California, during the National Training Center (NTC) Rotations 25-03 and 25-04. The events that took place after this tasking culminated with the successful completion of 1ID HQ's NTC Rotation 25-03 utilizing the AFN-OTM kit.

The Commanding General of 1ID, Major General (MG) Monté Rone, clearly articulated how integral the AFN-OTM equipment was to the success of Rotation 25-3: "AFN-OTM allowed the Big Red One (BRO) to fight dispersed, reduced our electromagnetic signature (EMS), and provided options to me as the commander that I previously would not have had in terms of how to echelon unit command posts, redundancy, and reduce transition time." This equipment set, combined with the new AFN-OTM enabled redesign of the Division command post structure, has the potential to revolutionize the U.S. Army armor formations' ability to conduct large scale combat operations (LSCO).

AFN-OTM's cutting-edge technology possesses the ability to transform the way armor divisions operate by enabling distributed command and control at the tactical level. The successful integration of AFN-OTM during NTC Rotation 25-03 has far-reaching implications, aligning with the priorities of the Chief of Staff of the Army, the FORSCOM Commander, and 1ID's Commanding General. This article will examine the significance of AFN-OTM in enabling distributed operations and how it supports the priorities of "continuous transformation, readiness, and continuous transformation to meet emerging threats."

The Program Executive Office for Command, Control, Communications & Network (PEO-C3N) equipped several 1ID vehicles, mostly High Mobility Multipurpose Wheeled Vehicles and Joint Light Tactical Vehicles, with an upper tactical internet (UTI) suite of transport, a baseband kit, and the Unified Voice Management System (UVMS). Each vehicle's UTI transport suite consists of a vehicle-mounted lower earth orbit (LEO) satellite communications (SATCOM) terminal, a "kick out" SATCOM terminal, a commercial cellular wireless router, two line-of-sight (LOS) radios and a bandwidth diversity solution, which automatically selects the best path of transport. Each vehicle's UVMS system provides the ability to call secure voice over internet protocol (SvoIP) phones located in the DIV command and control (C2) nodes and very high frequency (VHF) over the soft channel access unit (CAU), from inside the vehicles while both OTM and at-the-quick-halt (ATQH). 1ID also received four variable height antenna (VHA) drones. The VHA drones came in both tethered and untethered

configurations and extended the LOS signal path across vast distances to create a meshed network between AFN vehicles. Each vehicle is also equipped with a bandwidth diversity solution that uses the automatic primary, alternate, contingency, and emergency (auto-PACE) functions to ensure communications are working close to 100 percent of the time. Having communication equipment with that type of resiliency is unheard of in 1ID's current modified table of organization and equipment (MTOE) program of record for tactical network transport equipment.

The robust AFN-OTM UTI communications package enabled 1ID to become the first division-level rotation to complete an entire rotation without connecting to NTC's fiber infrastructure; truly operating as a "Division in the Dirt." 1ID's LTC Marreo Burch (ACoS G6), LTC Aaron Adams (ACoS G3), and LTC Duane Clark (ACoS G5) created an effective plan to utilize the AFN-OTM trucks for maximum dispersion of the Division's forward command posts (CP) – namely, the DIV Main and DIV tactical command post (TAC) - while simultaneously reducing the footprint of the DIV Main during the rotation. Four of the five DIV HQ AFN-OTM trucks accompanied a M1087 "expando truck" with an eight-port switch inside, which were allocated to specific DIV warfighting functions (WfFs)/sections (Intel/Fires, Plans, DIV TAC) and the mobile command group (MCG). The fifth AFN truck supported the DIV G2's analysis and control element (ACE), which had a massive bandwidth utilization requirement and was co-located with the rear CP at the Marine Corps Logistics Base (Yermo Annex). AFN-OTM's capabilities also enabled 1ID to become the first unit to jump their Rear CP during a NTC rotation, while maintaining situational awareness of combat operations during the movement.

Each AFN-OTM truck/expando combo conducted geographically distributed operations throughout the entire rotation, mostly operating away from the DIV Main and DIV TAC. While dispersed, each AFN-OTM truck/expando combo remained directly tied to the division's current operations on both UTI and Lower TI. The 1ID Network Operation functions allowed continued awareness of the common operating picture. What's more, this equipment reduced the need for ancillary equipment such as static antenna masts, cable spools, or multiple generators normally required for dispersion. The ability to operate multiple distributed CPs created several dilemmas for NTC's opposing forces (OPFOR) and presented opportunities for MG Monté Rone to successfully command the division from his MCG, while the DIV TAC or DIV Main simultaneously conducted multiple survivability moves throughout the rotation.

The AFN-OTM capabilities demonstrated during 1ID's NTC rotation directly aligned with the guidance of U.S. Army senior leaders. The Chief of Staff of the Army, General Randy A. George, has emphasized the importance of "*continuous transformation*" as a top priority.[1] This initiative focuses on developing a more competent, cohesive, and adaptable Army, capable of operating in a rapidly changing environment. The integration of AFN-OTM during NTC Rotation 25-03 demonstrated a significant step toward achieving this goal. By providing real-time situational awareness and enabling seamless communication between units, the AFN-OTM kit enhanced the effectiveness of command and control at the tactical level.[2] This, in turn, strengthens the profession by fostering a culture of innovation, adaptability, and decentralization, allowing junior leaders to make informed decisions and take initiative.[3]

The FORSCOM Commander's priority of "*readiness*" was also directly supported by the integration of AFN-OTM during 1ID's NTC rotation.[4] Readiness is critical in today's operational environment, where the ability to respond quickly and effectively to emerging threats is paramount. AFN-OTM enhanced readiness by providing 1ID's CPs, WfF and integrating cells Joint Air-Ground Integration Cell (JAGIC), ACE, Current Operations, and Plans the ability to operate in a distributed manner, leveraging advanced communication and networking capabilities to stay connected and informed.[5] The capability provided with this pilot allowed the DIV's Chief of Operations (CHOPS) and all subordinate units to use a "Strike Net" tactics, techniques, and procedures (TTPs) on a commercial collaboration service. This enabled units to respond rapidly to changing situations,

Figure 2. 1LT Thomas J. Allen assigned as the battalion communications and network officer for the 6th Squadron, 8th Cavalry Regiment, 2nd Armored Brigade Combat Team, 3rd Infantry Division showcases his unit's On-The-Move prototype equipment. *(U.S. Army photo by SGT Trento Lowery)*

making them more effective and efficient in their operations. Furthermore, the real-time situational awareness provided by AFN-OTM allowed units to anticipate and prepare for potential threats, reducing the risk of surprise and increasing overall readiness.[6]

MG Monté Rone's priority "*continuous transformation to meet emerging threats*" was also closely aligned with the integration of AFN-OTM during this NTC rotation.[7] The Division's focus on continuous transformation recognizes the rapidly evolving nature of modern warfare, where new technologies and tactics are constantly emerging. AFN-OTM was a key enabler of this transformation, providing units with the ability to adapt and innovate in response to changing circumstances encountered during NTC Rotation 25-03. By leveraging advanced networking and communication capabilities, units can quickly integrate new technologies and capabilities, staying ahead of emerging threats and maintaining a competitive edge.[8]

In conclusion, the integration of AFN-OTM vehicles and its associated equipment during NTC Rotation 25-03 marked a significant milestone in the development of distributed command and control capabilities at the tactical level. This new equipment set removes the limitation that organic MTOE equipment emplaced on bandwidth intensive WfF tools and Mission Command Information Systems, fully realizing their capability in training and operations. This rotation also demonstrated the potential of this technology to transform the way armored divisions operate in LSCO. By providing real-time situational awareness with nearly 100 percent uptime, enabling seamless communication between units, AFN-OTM supports U.S Army senior leaders' priorities of "*strengthening the profession*," "*readiness*," and "*continuous transformation to meet emerging threats*." As the Army continues to evolve and adapt to emerging challenges, the integration of AFN-OTM will play a critical role in enabling distributed operations and maintaining a competitive edge in LSCO.

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Major Adam Joseph Black currently serves as the Aide-De-Camp to the TRADOC Deputy Commanding General / CIMT Commanding General at Fort Eustis, Virginia. Previously, MAJ Black served as the Deputy G6 for the 1st Infantry Division and as the Brigade S6 for the 2nd Armored Brigade Combat Team, both at Fort Riley, Kansas. Major Black is a graduate of the Signal Officer Basic and Captains Career Courses, as well as the Command and General Staff College, and holds degrees in Computer Science, Business Administration, and Operational Studies. MAJ Black has been awarded the Bronze Order of Mercury, the Defense Meritorious Service Medal, and the Meritorious Service Medal.

Chief Warrant Officer 2 Justin Carrier is the Senior Network Operations Warrant Officer for the 1st Infantry Division at Fort Riley, Kansas. A highly certified network professional (CCNP, CySA+, Security+, ITILv4), CW2 Carrier previously served in network operations roles within the 2nd Armored Brigade Combat Team and 1st Sustainment Brigade at Fort Riley, as well as with Joint Special Operations Command and the 4th Psychological Operations Group at Fort Bragg. CW2 Carrier holds degrees in Signal System Support and Information Technology Management, and completed training at Fort Gordon and Fort Benning. CW2 Carrier is a recipient of the Joint Service Commendation Medal and multiple Army Commendation and Achievement Medals.

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BREAKING THROUGH:

Combined Arms Maneuver Against Prepared Defenses

Photo by Winifred Brown

by LTC Darrell Fawley

It has been more than 20 years since the United States Army has conducted combined arms maneuver at scale during combat. Over more than three years, however, the Russo-Ukraine War has offered an opportunity to study the effectiveness of maneuver. The results, so far, are not promising. Both sides have seen major offensives stalled, making incremental gains after a significant commitment of time, resources, and personnel. It would be easy observing the challenges of offensive actions on both sides to see an era of defensive warfare arriving, however, defensive warfare will never suffice as a primary means for the US Army. The role of the Army since the Spanish-American War has been to fight forward and therefore nearly all goals require a positive (offensive) action to achieve results. Therefore, like the Western Front in World War I, new tactics must emerge to enable combined arms maneuver.

11th Armored Cavalry Regiment (ACR) conducts at least one brigade-level maneuver against a prepared defense every rotation for eight rotations per year. During that time, the Regiment has developed and refined a series of techniques to help break through an enemy in a prepared defense. These techniques and tactics do not eschew doctrine. For example, when breaching, the Regiment still plans for, rehearses for, and employs the breaching fundamentals of Suppress, Obscure, Secure, Reduce, and Assault (SOSRA). However, the Regiment has experimented with a mix of doctrine and emerging techniques to enable it to break through a defense. There is no better example of this than Rotation 23-07 when the Brigade Tactical Group (BTG) attacking with two mechanized infantry battalions and a tank company reserve, infiltrated a division cavalry guard and then penetrated an armored brigade combat team defense.

What follows is a discussion of five tenets originally developed by Major General Curtis Taylor, then commander of the National Training Center, and refined by 11 ACR (Blackhorse). The Regiment proffers these as a means of helping the Army prepare for its next large-scale combined arms maneuver.

Drive specific intel to the tactical edge. All the intelligence in the world doesn't matter if the person needing it does not have it. Lower echelons have less means of processing and analyzing intelligence and data, so it is incumbent on higher echelons to not provide data so much as answer priority intelligence requirements (PIR) and provide analysis. A tank platoon leader leading as the advance guard should know about the three main battle tanks dug in behind CHOD Hill just as much as the Division or Brigade Intelligence Officer. Higher echelons can err in determining what intelligence a lower echelon requires. Therefore, during planning and rehearsals, the Regiment focuses on learning the information requirements of subordinate units and arraying multiple intel sources to answer these questions in time and space. This is necessary because at the BTG level, certain PIRs are not obvious. When looking at an operation at brigade scale, the BTG commander and staff likely would not task any element with determining individual tank fighting positions in a battle position. But, to a platoon leader heading into an engagement area, that information is critical.

Commanders provide PIRs to the S2, generally in a window of time following the initial orders brief and prior to the combined arms rehearsal. The BTG will accept Requests for Information (RFI) up to a predetermined cutoff point. This point ensures that all PIRs are duly investigated and prevents paralysis by analysis. At some point, more information is unhelpful. To ensure proper arranging of assets, the BTG requires commanders to provide a latest time information of value (LTIOV) which ensures it answers the most important questions first and gets the

information to subordinate commanders in a useful time frame. The BTG seeks to answer PIRs in order of usefulness but also arrays assets under a concept of a probable time of contact (PTOC). The BTG commander is more likely to use intelligence and fires assets for shaping when there is a large gap from the present time to the PTOC, but as the PTOC grows near, he is more likely to push those assets to support the unit close to making contact. The position of a tank 48 hours from LD might be unhelpful, but the BSA or main CP is much less likely to move and may make sense to strike at that point versus closer to the contact when assets are needed against the enemy front.

The BTG also uses a final intelligence dump attempting to ensure that lower commands have the same picture as the BTG prior to the fight. Usually this occurs at 2 hours prior to LD to give commanders time to make any final adjustments and not have information flowing in the last minute. Commanders at echelon have access to intelligence chats and dumps from the Division Tactical Group to flatten the flow of information. The BTG still conducts analysis because the lower echelons have staff that are not mature or no staffs at all. But a commander at any echelon can pull data from higher.

It is critical that units instill map board discipline in their subordinates. All the work of developing intelligence for the tactical edge is for naught if the platoon leaders and company commanders on the march do not have that intelligence on their map board.

Conduct detailed reconnaissance to identify micro terrain. The old adage that "If I were given an hour in which to do a problem upon which my life depended, I would spend 40 minutes studying it, 15 minutes reviewing it, and 5 minutes solving it," might better be said of the offense: "If I were given an hour in which to come up with a tactical solution, I would spend 40 minutes staring at the map, 15 minutes reviewing what I had seen, and 5 minutes arraying force." Studying terrain enables the commander to know what is possible, what is impossible, and what might be done. Commanders need to understand the terrain they will move through and fight on to determine speed, formation, and defilade as well as likely enemy positions. One of the advantages of Blackhorse (is knowledge of terrain, which is not uncommon knowledge given how many people across the Army have fought on our home field. However, many across the Army believe Blackhorse fights from the same terrain each rotation. In reality, every rotation has a different design – and sometimes direction – and individual units rotate where they fight, so rarely would any leader spend two consecutive fights in the same area. But due to experience, Blackhorse leaders begin to learn how to read and use terrain. Map reconnaissance is the first step.

Obviously, a smart commander will augment map reconnaissance with whatever means are at hand. Maps are imperfect and do not account for environmental effects. Hard rains in the desert can change the trafficability of routes or even wash some routes so well that they blend with the rest of the desert floor. Similarly, routes and areas that look like good ground for maneuver on the map can offer little but

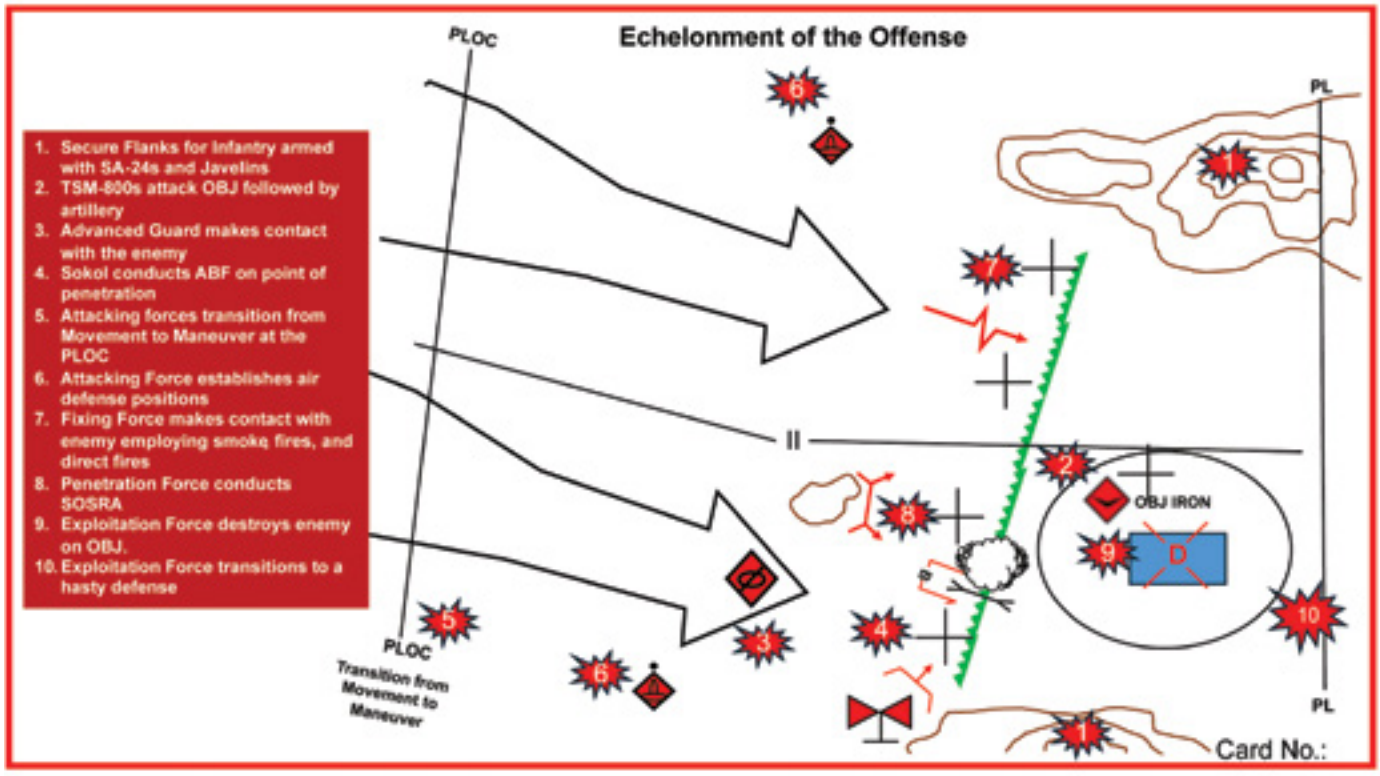

Figure 1. Echelonment of the Offense. *(Image by author)*

Figure 2. A rotational training unit maneuvers through the box as several Observer Controller/Trainers (OC/Ts) look on. *(Photo by author)*

frustration for any attacking force. Therefore, while a map recon is sometimes all that is available to a commander, commanders should fight for more information in forms such as satellite imagery and reports from scouts. Overhead flights are not a bad way to recon a route, but this has limitations. First, anything in the air is subject to enemy direct fire and air defense measures. Second, flight has a way of flattening terrain. It can be hard to see the microterrain from the air when flying at certain heights above ground level. There are areas of the National Training Center "Box" that look far more inviting from the air than they do while driving through.

Therefore, ground route reconnaissance, if possible, is an imperative. The Regiment has had success when units conduct route reconnaissance prior to attacks and go as far as the enemy will let them. Since the best avenue of approach is a covered and concealed one unless speed is of the essence, conducting recon of little used routes or ones that have heavy crossing marks on the modified combined obstacle overlay (MCOO) enables us to move further undetected or to hide our true intentions. Blackhorse would rather take a route that enables undetected movement than one that enables speed or mass. At a minimum, the commander of the advance guard needs to conduct this reconnaissance, but, at times, the military intelligence battalion (MIBN) commander will personally recon the route. In the best of conditions, this is ideally done in like-light conditions and like vehicles to simulate the attack conditions. This will identify the rate of march, the formations available, and the positions of defilade as well as frequency modulated (FM) communication blackouts and other factors affecting the tempo and control of the attack. This is important because the map and the actual terrain often look different and finding this out on the march is often a fit of folly and leads to slow and stalled attacks, proving time to the enemy to detect movement and reposition.

Employ smoke and suppression to enable maneuver. The key element of this tenet is that smoke and suppression are enabling all maneuver, not just actions on the breach. The tenets of SOSRA remain fundamental to actions, but smoke and suppression enable the approach as well as the actual breach.

Employing artillery delivered smoke is difficult and requires understanding of wind and a ready observer to adjust the smoke immediately. It also requires patience to allow smoke to billow. All sorts of weather affect smoke. Since the BTG lacks a weather officer, typically it uses data from apps and observations from those on the ground.

BTG Mission and Commander's Intent

Mission: The 801st BTG conducts a mobile defense between PL Debbie and PL Betty from 221800APR2024 to 250700APR2024 to allow the 802nd BTG to establish a deliberate defense in the Central Corridor. O/O the 801st BTG counterattacks along Axis Iron to deny the enemy an ability to consolidate for an attack into the Central Corridor.

Commander's Intent

Expanded Purpose: The purpose of this operation is to buy time for the 802nd BTG. Critical to this operation is preventing the enemy from establishing a screen along PL Mike. This is critical because a screen would prevent an integrated counterattack. We seek to push the enemy to the east and then fix them before counterattacking south through Siberia.

Key Tasks:

1. Render the Enemy Deaf, Blind, and Mute: Defeat their reconnaissance, destroy their command posts and mission command systems, and destroy or degrade their information collection systems forcing them to fight disaggregated.
2. Attrit him inch by inch: Mass the effects of drones, fires, aviation, and maneuver to force the enemy to take ground at extremely high costs. We don't care about any of this ground, but we want him to think we want it all.
3. Keep the Road Open: Push the enemy off to the east so that the counterattack has a route south through Siberia. Block in the center; give way in the east.
4. Preserve combat power: Use passive and active means to keep our combat power alive to kill the enemy.

Decisive Point: Destruction of two enemy companies IVO Snowcone as this will force the enemy further east, delaying him by 24 hours, and enabling an effective counterattack.

End State: At end state, the 802nd BTG is postured to defend the Central Corridor, the 801st has pushed the enemy back to PL Debbie, the enemy is unable to resume offensive operations for 24 hours, and the 802nd BTG controls PL Mike.

Figure 3. Example BTG Mission and Commander's Intent *(Image provided by author)*

However, units can come up with more sophisticated means. Most important is that the smoke target belongs to someone. While fire support officers can plan a primary and alternate observer, the Combined Arms Rehearsal (CAR) or fires technical rehearsal will help determine the right person. The commander must assign someone and there must be criteria for movement. The assigned soldier must be in position to observe and have direct liaison with the firing organization.

The BTG uses fires to suppress or destroy positions that use direct fires on the approach, such as javelin positions and fighting positions. The BTG also uses fires to suppress or destroy enemy fire support and disrupt command and control. While logistics are lucrative targets in general, during an attack the usefulness of counter-logistics fires wanes since the enemy is static and has interior lines. Overall, the commander and the staff must consider the broad use of fires to disrupt the enemy and enable the attacking force to close with the front line of the defense.

In this case, attack aviation must be seen as a fires asset because aviation is enabling maneuver. The task force prefers to use aviation to soften up its point of penetration to enable the maneuver of the main effort. The task force receives little in the way of air support, so a normal unit should think more broadly on how to use available air assets to layer against a defending enemy. The BTG does not push aviation to subordinate battalions. Though the asset may be in support, it is a limited resource and must fit into the overall intent of the commander.

Using fires and smoke in a coordinated method requires a fires technical rehearsal to validate the timing of fires, to ensure all parties are ready to fire, and to ensure observers are in position and understand their requirements.

While not covered in this tenet, the attacking force must consider how air defense enables maneuver. The BTG spends time in planning and rehearsals to ensure that it has an air defense bubble established and that it jumps air defense at the right time so that there is never a time when all assets are jumping. This includes the totality of assets. While the BTG does not use US systems, think of this in terms of Stinger positions on high ground, Avengers on the move, and higher assets further back.

Employ a capable advanced guard and focus on a narrow point of penetration. It can be tempting to try to push hard against the entire line or find multiple points of penetration, but it is easiest when focusing on a narrow area. Placing overwhelming strength on a vulnerable enemy location makes the likelihood of success much more assured. The advanced guard should be small; in the case of the BTG it is usually one tank and two fighting vehicles. The advanced guard should be sufficiently far forward to ensure that follow on units don't run into it if it gets bogged down and that follow on units can shift to a new route or point of penetration based on the results. The advanced guard must have comms with follow-on forces to let them know when to halt in defilade and when to be prepared to pass. A unit that enables the advanced guard to make the call to pass follow on forces will be more efficient and maintain a better tempo. The next tenet discusses this further, but a unit must, in the words of LTC Rick Ferrell, former commander, 1/11 ACR, "march dispersed and fight united." It is unlikely that on the current and future battlefield, a unit can survive massing into large assembly areas or attack positions of company size or higher. Units should seek to only hit a column once in formation for the attack.

It is important to use deception and a capable fixing force. The best deception reinforces the enemy's bias or demonstrates a plausible scenario. For example, the BTG decoy command posts are located in areas a brigade might place theirs. While these are not in areas the BTG would place its CP, it reinforces the biases of the enemy and enables deception. Similarly, any deception the task force employs will reinforce a bias or a likely scenario. One way the BTG does this is to consider how it can, with a small force, trip a particular intelligence system to see an action as something bigger. Another option is to use a fixing force that looks like an attacking force. This happens always in the attack, where a fixing force employs the same elements that a penetration force might. This means, at a minimum, conducting the first three steps of a SOSRA and possibly giving engineer assets to the fixing force. Typically, this force will take the more likely avenue of approach, thus selling it as the main effort. Sometimes, the task force follows this force

Figure 4. 11th ACR maneuvers under a smoke screen while being observed by senior leaders. *(Photo by author)*

with a group of tracked vehicles such as M88s and M113s to kick up dust and look like a larger second echelon force. The feint must look like the main attack, or it won't work. The added benefit of beefing up the feint and fixing force is that it can exploit a seam and potentially contribute to or become the attacking force as has happened on more than one occasion. At times, the BTG will send two attacking forces with the exploitation force sufficiently distanced to allow flexibility. In this case, neither attacking force is the penetration or fixing force, but the BTG is postured to exploit success and both attacking forces are resourced to penetrate.

All of this is subject to intense scrutiny during CARs as the BTG commander and staff work to ensure all the observers are covered (smoke, fires) and that all calls are covered (suppression, obscuration, etc.). Every aspect of the attack must have someone responsible and a shared understanding of conditions (i.e. suppression means 50 rounds of 155 mm and is called by the advanced guard commander, alternate OP1). The BTG will often redo portions of its CAR when planning attacks on dug in enemies to ensure every aspect is synchronized in time, space, and purpose. Commanders must commit to detailed rehearsals to ensure success. Rehearsals cannot be back briefs.

Not explicitly covered in this tenet, but important, is that a commander must secure his or her flanks. The BTG usually plans to send in dismounted infantry in advance of an attack to secure the high ground anchoring the defense and push out anti-tank gunners. This allows the maneuver commander to focus on the enemy to his or her front.

Conduct bounding overwatch and make rapid sprints from areas of defilade. Units must be in formation as they cross the probable line of contact (which must be on their map board) and move into bounding overwatch. No vehicle or section should bound without support and without knowing its next position of defilade. A good route reconnaissance will ensure that units can rehearse this prior to moving out. There also must be someone directing the bounds to ensure that units do not bunch up. Inevitably, the tempo slows around the breach and even getting to a bypass takes time. If a commander is not directing movement across phase lines, then units inevitably bunch up and become prime targets for artillery and aviation.

When stopped, vehicles must use the terrain to cover and conceal themselves. If not, they will be easily detected and likely not survive. As the tempo slows, units must be prepared to pass the next echelon forward at any time. In fact, the attack of a brigade looks similar in some ways to a platoon assaulting a trench or building. As teams must stop to lock down a bunker or hallway, sections and platoons often have to suppress or fix an enemy. Therefore, the follow-on unit must be ready to continue the attack. Just like any fire team must be able to carry out any portion of the attack on a building or trench, any platoon or section must be able to pick up any portion of the attack. Thus, leaders at echelon from section on up must understand the breadth of the plan. Similarly, leaders must know all available routes and be prepared to divert as those in front of them become fixed or a position appears stronger than expected. This may seem counterproductive to the concept of picking a narrow point of penetration, but a commander should not continue to throw tracks against an enemy wall if the wall isn't cracking.

Conclusion

These five tenets have proven successful for the 11 Armored Cavalry Regiment attacking with a smaller force against a prepared ABCT defense. When well planned, rehearsed, and executed they can be successful. Commanders must apportion assets to be successful and use CARs to make sure actions and assets are synchronized in time, space, and purpose. The Russo-Ukraine War has demonstrated that without effective combined arms maneuver, war will stagnate into stalemate and the military will find it tough to achieve its objectives. It is incumbent on units that prepare to attack a prepared defense. This article offers one method of doing that.

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General Abrams's Impact on Modern Armored Warfare and the M1 Legacy

by SGM Steve Gonzalez

Few military leaders have left a legacy so powerful that the Army engraved their name into its most advanced combat system. Literary reviews identify key factors that led to the development and implementation of the M1 Abrams main battle tank.[1] Among those leaders, General Creighton W. Abrams stands out as the most influential figure in shaping how the U.S. Army uses tanks in combat.[2] From battlefield victories in World War II to leading strategic reforms in doctrine and training, General Abrams reshaped the Armor Branch into a modern and adaptable force.[3] He believed in leading from the front, moving with speed, and using combined arms teams to overwhelm the enemy. His battlefield decisions at Bastogne, his efforts to develop future leaders, and his push for realistic training helped prepare the Army for both Cold War missions and large-scale combat operations. Even after many years, the Army still uses General Abrams's ideas in its training and doctrine, training centers, and tank units.[4] The Army named the M1 Abrams tank after General Abrams to honor his leadership, and today it stands as a lasting symbol of his legacy. The tank keeps improving and remains one of the most lethal weapons on the battlefield. General Abrams fundamentally transformed the Armor Branch through innovative tactics, leadership in doctrine development, and the enduring legacy of the M1 Abrams main battle tank.

Figure 1. General Creighton W. Abrams smoking a cigar (Image retreived from National Archives)

Decisive Maneuver and Command Philosophy

As commander of the 37th Tank Battalion, 4th Armored Division, during World War II, General Abrams demonstrated boldness and precision under General George S. Patton's Third Army. He led his battalion in the critical breakout at Bastogne during the Battle of the Bulge, executing rapid, aggressive maneuvers that disrupted enemy defenses and created confusion along German lines. These actions helped Army leaders see tanks as powerful battlefield tools.[5] General Abrams taught his Soldiers to move quickly, take charge, and find weak spots in the enemy's defenses. He treated movement and maneuvers as psychological weapons that could keep adversaries off balance and force reactive decision-making by using the effectiveness of combined arms.[6]

Combined Arms Effectiveness

General Abrams believed it was important for tanks, scouts, and artillery to work together as a team. His strong leadership helped win many battles and gave people new ideas about how to fight wars after World War II. Military historians credit his battlefield tactics as critical to Cold War maneuver strategies.[7] Army trainers will still talk about how General Abrams led his Soldiers.[8] They use his style to teach, coach, and mentor others to be swift, work well together, and ready for change.[9] He believed good leaders should take action instead of waiting for the perfect time.[10] His ideas helped the Army figure out how to push enemies back, use the terrain to their advantage, and keep moving quickly and strongly in battle.[11] These battlefield insights also influenced how U.S. Army Europe prepared its Cold War contingency plans, emphasizing the rapid exploitation of enemy weaknesses across terrain corridors in Central Europe.[12]

General Abrams's Impact on Training and Leadership Growth

General Abrams modeled a leadership style rooted in teamwork among tanks, infantry, and artillery. He required intense preparation and rehearsals to promote unit cohesion and battlefield trust. Officers and non-commissioned officers (NCOs) who served under General Abrams returned to the institutional Army and replicated his methods everywhere they were assigned. Commanders incorporated his method into doctrine, emphasizing flexibility, tempo, and mission-type orders that liberated subordinates.[13] He mentored young leaders to make ethical decisions that would lay the groundwork for them to make adaptive decisions

Figure 2. Secretary of Defense Melvin R. Laird, second from the left, administers the oath of office to General Creighton W. Abrams, the new U.S. Army Chief of Staff. *(Image retrieved from The National Archives)*

under stress.[14] This approach not only transformed leader development throughout the Armor branch but also carried over to inform joint leader development models.[15] Field manuals (FM) like FM 6-0 discuss mission-type orders that reflect General Abrams's intent-based operations.[16] Army institutions such as the U.S. Army Armor School continue instructing his methods as foundational to developing operational leaders.[17] Many leader development programs still reflect his legacy by preparing senior leaders to operate in complex environments.[18] In addition, General Abrams called for more realistic training rather than routine training. He argued that training scenarios must mirror the unpredictability and challenges of combat, a principle that influenced the design of modern large-scale training events.[19] These innovations established the intellectual foundation for the modern Mission Command philosophy adopted across U.S. forces and taught in multinational training centers.[20]

Influence on Training and Force Design

After World War II, General Abrams advanced to high-level strategic leadership roles, eventually serving as Chief of Staff of the Army. Under his leadership, the Army embraced reforms emphasizing professional development and career-long training pipelines during the Army's transition to the all-volunteer force. This model improved retention and professionalism in armored formations.[21] General Abrams directed the institutional Army to prepare for future conflict by prioritizing realistic, high-intensity training in peacetime. He oversaw the development of training centers like the National Training Center, where armored brigades engage in force-on-force battles using live opposing forces. These innovations shaped how the Army evaluates combat readiness.[22] He also spearheaded the use of simulations, gunnery tables, and performance-based evaluations for tank crews. General Abrams created a culture that rewarded competence and accountability by tying training to mission performance. Experts agree that these training enhancement reforms are still used.[23] Combat training center rotations that stress synchronization and realism in tactical scenarios continue to reflect General Abrams's influence.[24] General Abrams also urged Army leaders to assess how doctrine interacted with training.[25] He ensured doctrine did not exist in isolation but directly informed and was informed by training evolutions.[26] Through his integration of doctrine and training, General Abrams reinforced the idea that real-life combat experience should guide how Soldiers train and get ready, not just what they learn in a classroom or practice during peacetime, essentially shaping modern doctrine to train as we fight.[27]

Shaping Modern Doctrine

Although General Abrams passed away

before its adoption, his focus on movement and maneuver directly influenced how Army leaders designed the AirLand Battle doctrine.[28] General Abrams promoted the idea that battlefield success relies on fast, decisive action guided by a commander's intent. This philosophy evolved into the Mission Command principle used throughout current Army operations. Doctrinal publications from the 1980s to today trace their lineage to General Abrams's leadership model and ideas on initiative-based operations. He also helped reform Army culture following the Vietnam War by endorsing transparent leadership and restoring public confidence in the military.[29] General Abrams emphasized operational flexibility over rigid scripting, a shift that led to the Army's ability to adapt rapidly during future conflicts, such as Desert Storm.[30] Multi-domain and large-scale combat operations continue incorporating many of his ideas on flexible leadership and offensive maneuvers. General Abrams helped shape a mindset that rewards initiative, operational depth, and synchronized support in modern doctrine. As military threats evolve, planners still return to General Abrams's principles to ensure doctrine remains agile and ready to confront future challenges. The Joint Warfighting Concept and new North Atlantic Treaty Organization (NATO) strategies still use many ideas that General Abrams supported, showing that his leadership style works even today. This lasting influence on war planning and leadership helped set the stage for one of his greatest legacies, the Army's decision to name its premier battle tank after General Abrams.[31]

The M1 Abrams: A Legacy in Steel

The U.S. Army named its new main battle tank the M1 Abrams in 1980 to honor General Abrams. The creation of the tank provides speed, protection, firepower, and the capacity to succeed in any terrain, the same things General Abrams believed were important in battle. The Army equipped the M1 with composite armor and a 105mm cannon, later upgrading it to a 120mm smoothbore version mounted directly onto a gas turbine engine to improve mobility. General Abrams designed the tank with a modular approach, allowing decades of upgrades and showcasing his forward-thinking philosophy. The M1A2 SEPv3 Abrams tank combines active protection systems, digital architecture, and sensor-enabled targeting networks that facilitate combined arms integration; these center on General Abrams's central tenets of technology superiority as the ultimate force multiplier in combat.[32] U.S. Army acquisition documents emphasize how General Abrams and his vision of overcoming the challenges of speed and accuracy drove core design decisions during the platform's development. The evolutionary design of the tank makes it adaptable to aircraft and missiles with increasing speed and range, showing how General Abrams planned and led with future goals in mind. Army engineers and planners kept improving the M1 tank by adding new technology like smart computers, drone controls, and extra layers of protection. These upgrades keep the tank agile and ready for modern battlefields by integrating high-speed computer systems and advanced movement tools, turning some of General Abrams's ideas for the future into real features on the modern battlefield. These improvements maintain the tank's strength and demonstrate that General Abrams's ideas still matter in how the Army fights.[33]

Figure 3. U.S. Army Gen. Creighton Williams Abrams, right, commander of the Military Assistance Command Vietnam, attaches a campaign streamer to a unit flag during a ceremony in Vietnam. *(U.S. Army photo)*

Operational Effectiveness and Symbolic Influence

The M1 Abrams tank showed how strong and smart it was during Operation Desert Storm when U.S. tank crews destroyed enemy forces from afar very quickly.[34] U.S. allies like Poland, Egypt, and Australia also operate the Abrams tank, proving that General Abrams's leadership principles benefit not only the U.S. but NATO forces as well.[35] Its success proves that General Abrams was right about how training, firepower, and movement win and succeed in battle.[36] Soldiers still see the Abrams tank as more than a machine; it

stands for strong leadership and toughness.[37] The newest upgrades to the tank show that General Abrams's big ideas about fighting are still important, and it is not over, as they prepare for the best version of the M1 Abrams-main battle tank, the M1E3.[38] The tank means more than just metal and weapons; it has stood for many years of intelligent fighting and strong leadership. It still gives ideas and pride to Army leaders who plan and lead battles for today and the future.

Conclusion

General Creighton W. Abrams made a strong and lasting impact on how the Army fights. During World War II, his actions showed the value of quick thinking, bold leadership, and teamwork on the battlefield. He helped improve how Soldiers train and how leaders are developed in the Armor Branch. The M1 Abrams tank reflects his ideas about speed, power, and readiness for future battles. General Abrams fundamentally transformed the Armor Branch through innovative battlefield tactics, influential leadership in Army doctrine development, and a lasting legacy embodied in the success of the M1 Abrams main battle tank. As the Army transitions to the M1E3 and integrates smart-enabled systems, General Abrams's principles of adaptability and decisive force remain central to doctrinal development. His legacy continues to shape how the Army trains, leads, and wins across every battlefield it faces.

Sergeant Major Steve Gonzalez currently serves as an Operations Sergeant Major within the 316th Cavalry Brigade, Fort Benning, Georgia, with a distinguished career including prior assignments as First Sergeant of 1st Battalion, 77th Armored Regiment and 1st Battalion, 29th Infantry Regiment, as well as roles as a Senior Operations NCO at the Pentagon and a Senior Drill Sergeant at Fort Benning. SGM Gozalez was assigned as a M1 Abrams Tank Gunner and Section Sergeant with the 4th Infantry Division and 1st Armored Division, deploying in support of Operation Iraqi Freedom. SGM Gonzalez holds a Bachelor of Science in Business Administration and a Master of Science in Emergency and Disaster Management from Trident University International. SGM Gonzalez is also a graduate of the Sergeants Major Academy (Class 75) and numerous other leadership courses. SGM Gonzalez is a highly decorated Soldier, recognized with the Bronze Star Medal, Army Commendation Medal with Valor, and numerous badges and awards, including foreign honors and recognition as the Fort Benning Volunteer Soldier of the Year in 2013 and 2021.

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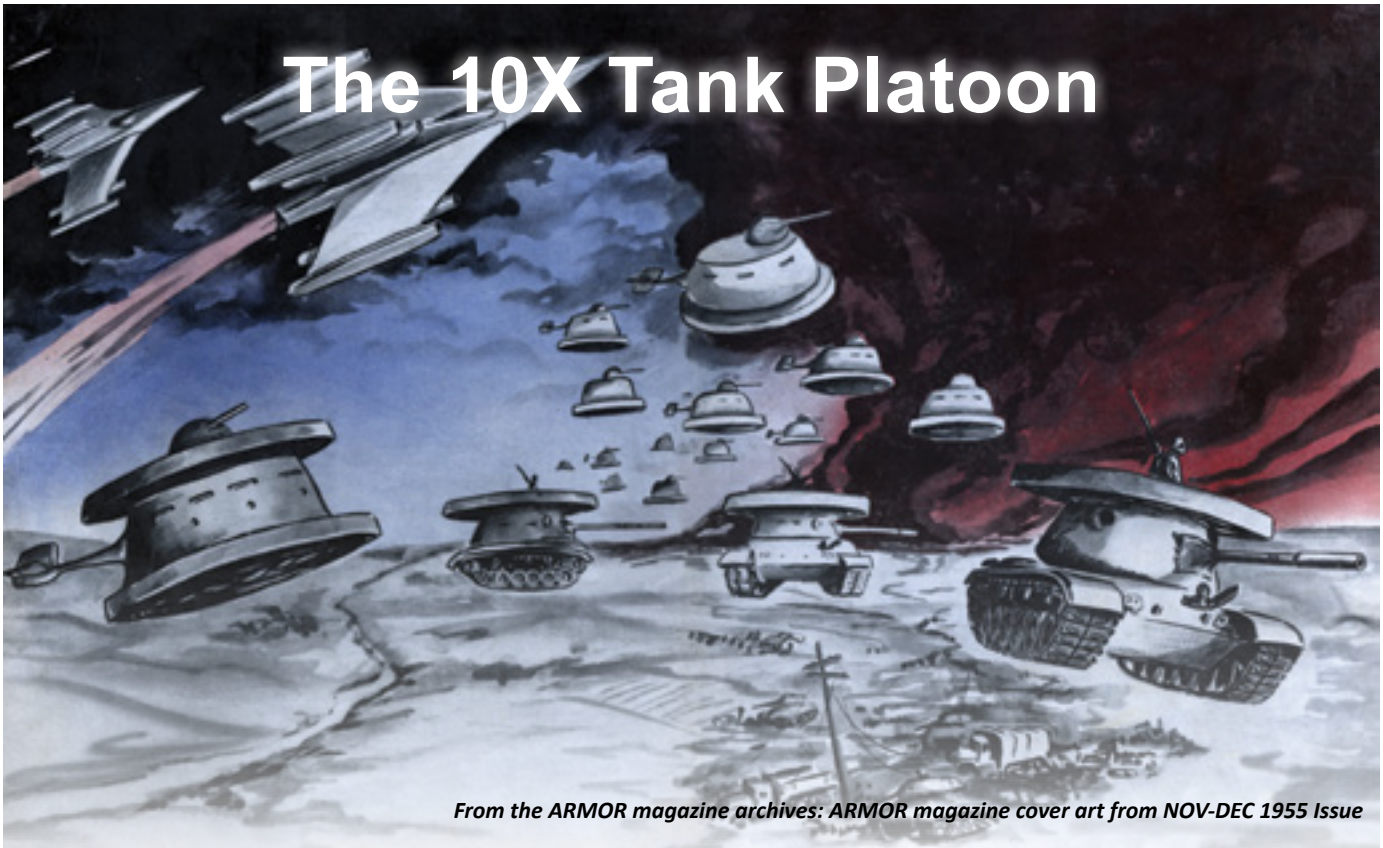
From the *ARMOR* art archives

"Armor Strong"

The 10X Tank Platoon



From the ARMOR magazine archives: ARMOR magazine cover art from NOV-DEC 1955 Issue

by Ted Maciuba

Your boss — whether a Tank Platoon Sergeant, a Combined Arms Battalion Commander, or a leader at the highest levels like the Chief of Staff, US Army (CSA) or the Secretary of Defense — challenges you to think about what it would take to field a tank platoon that is 10 times more lethal than the current Abrams platoon. Would you focus on improving the Abrams with a larger cannon, an autoloader, and better ammunition? Or would you design a tank platoon, equipped with armed robots and sufficient firepower, to defeat a foe with ten times the armor?

The Combat Developers at the Maneuver Capabilities Development Integration Directorate (MCDID) at Fort Benning, Georgia, took the latter approach with the dismounted infantry platoon.

Six years ago — before the Second Nagorno-Karabakh War, before the latest Russo-Ukrainian War, and before the Gaza War — Robotics Requirements Division (RRD) and the Maneuver Battle Lab (MBL), parts of Army Futures Command's MCDID, ran the most important and consequential simulation experiment (SIMEXp) in its history, but no one realized it at the time: the 10X Robotic and Artificial Intelligence Equipped Dismounted Infantry Platoon initiative, known familiarly as 10X.

The 10X SIMEXp brought in military role players from Task Force 1st Battalion 28th Infantry Regiment, 3rd Infantry Division — two Captains, a First Lieutenant, and a Staff Sergeant — who were the first to be able to pull back the curtain and see the future of Platoon-level warfare[1]. They faced a daunting mission: leading a dismounted infantry platoon in an attack against a light-armored motorized rifle company (MRC) defending in strength. They were significantly outnumbered, facing a 1-to-3+ disadvantage. This mission would have been more appropriately assigned to an infantry or combined arms battalion.

The situation was further complicated by the platoon's role in a supporting mission. It wasn't part of the main effort at any level – company, battalion, or brigade combat team – and therefore received no priority for external support like mortars, artillery, attack helicopters, or close air support.

The 10x SIMEXp began with baseline runs, providing the role players with a standard dismounted infantry platoon equipped with current gear.

As expected, the platoon performed poorly in these baseline scenarios, repeatedly suffering catastrophic casualties and failing to achieve its mission against the MRC.

In stark contrast, the 10X advanced case gave our role players a 10X Infantry Platoon equipped and enabled with a system-of-systems of near-term armed air and ground robots and artificial intelligence technologies. The 10x platoon's three key lethality systems were: the Apache helicopter's lightweight 30mm cannon mounted on a small multipurpose equipment transport (SMET); and swarms of armed drones and loitering munitions (LM), both launched from a SMET.

Instead of engaging the enemy with rifles at close range (under 500m), they could now engage and kill the enemy out to 5,000m, a clear tenfold increase in lethality. A corollary of this range extension is that the 10X platoon, through the magic of geometry, could

increase lethality (and situational awareness) dominance from 1 square kilometer (KM) to a 75-square-KM circle and the oblate hemisphere above it.

Our 10X advanced case platoon successfully defeated the MRC in every iteration, killing many of the enemy Soldiers and most of the light armored vehicles. The 10X platoon's losses were limited to robots, and Soldiers never even needed to fire their personal weapons.

An Army student group attending the Naval Postgraduate School analyzed[2] the unclassified data from the 10X SIMEXp and confirmed a 10X increase in effectiveness. Their study included a regression analysis, which calculated that increased 10X Platoon effectiveness was a function of the number of armed drones and LMs but, interestingly, that the 30mm cannon did not increase the effectiveness of the 10X Infantry Platoon. This insight supported the idea that the atmospheric littoral[3] (later renamed the air–ground littoral) above the ground maneuver force (another oblate hemisphere) is key terrain that must be dominated to ensure future mission success.

To restate the obvious, the 10X SIMEXp demonstrated that a dismounted infantry platoon, enabled by appropriate robotics and AI and dominating the air–ground littoral, could operate effectively over the same time and space as a current Infantry Battalion.

Let's turn to the current tank platoon that is made up of four exquisite and expensive Abrams Tanks costing on the order of $100 million and weighing about 300 tons — we can use that as the 10X Tank Platoon constraints.

Our extended hypothesis is: Can a 10X Tank Platoon, equipped with robotics and enabled by AI, operate over the same time and space as a current 44-Abrams Tank, Armor–pure (since we want an apple-to-apples comparison) Battalion?

Before we address our new hypothesis, I think it is valuable to discuss the back story of Army Robotics and 10X.

Over a quarter-century ago, the Army, based on missions that it could not accomplish in the Balkans, decided that it needed to modernize ground maneuver and started development of an Objective Force, which eventually morphed into updated Operational and Organizational (O&O) concepts as well as technologies pulled together into the system-of-systems that would be fielded as part of a Future Combat Systems (FCS) Brigade Combat Team (BCT) (FBCT)[4].

The FCS O&O concept posited situational awareness approaching 100% from unmanned ground and robotic sensors (most combat developers laughed at that), significantly increased lethality, force protection from being able to maneuver out of contact, and improved logistics from commonality of components and hybrid electric drive. Of particular interest in this context were the unmanned aerial vehicles (UAV), with one UAV per unit at each echelon from platoon to BCT, armed robotic vehicles (ARV), Multifunctional Utility/Logistics and Equipment Vehicles (MULE), and, most importantly, the network that tied all FBCT systems together.

The replacement for the Abrams, the 20-ton FCS mounted combat system (MCS), had a 120mm cannon-launched mid-range munition (MRM) to engage moving armored targets up to 10X farther away — a 10X increase in lethality proposed 20 years ago. MRM was part of the suite of 120mm cannon ammunition, along with the advanced kinetic energy (AKE) and advance multipurpose (AMP) rounds. All were initially cancelled as part of the FCS termination decision, a prime example of throwing the baby out with the bathwater. Through exemplary staff work, Mounted Requirements Division (MRD) was able to resuscitate the AKE and AMP rounds, which is why Abrams tankers now have the M829A4 and M1147 rounds available, as well as an ammunition data link capable of supporting a 120mm-cannon-launched, beyond-line-of-sight capability to kill armored targets at ranges 10X beyond current ammunition.

FCS is commonly considered a failed concept and program, but many of the ideas and technologies proposed in the FCS O&Os have and will continue to enter the Armored Force as the technologies mature.

A decade ago, the Deputy Secretary of Defense proposed the idea of offset strategies[5], increases in effectiveness (let's say 10X) of US Forces based on overmatching technologies. We took that strategic concept and brought it down to the tactical ground maneuver level, simplifying the offsets in terms of Soldiers, bullets, and kills to make it understandable by all tankers and infantry Soldiers, and especially four-star generals.

Starting with a base line of US Army Armor and Infantry lethality capabilities in World War II, there was barely parity with our enemies. It took dozens of tank cannon rounds and some luck to kill an enemy tank, and tens of thousands of small arms bullets to kill a dismounted Soldier.

Nuclear weapons in the First Offset at the end of World War II provided overwhelming overmatch, but that advantage was short-lived. During the Cold War, our adversaries caught up quickly and started to field their own nuclear arsenals. They also fielded many more conventional forces and much more equipment than the Army, so the Army had to "fight outnumbered and win."

The Second Offset of precision weapons and sensors gave Abrams gunners and Infantry Antitank Guided Missile gunners high-probability-of-hit and -kill capabilities at extended ranges, which was proven by the success of Army tactical ground maneuver in Operation Desert Storm. Even with improved night-vision devices, it still took tens of thousands of rounds of small arms ammunition to kill a dismounted Soldier. Again, our adversaries caught up with improved tanks, weapons, and sensors, so a Third Offset of robots,

Figure 1. Offsets in Tactical Ground Maneuver[1&2] *(Photo by author)*

autonomy, and AI technologies is now being developed and fielded, but not fast enough.

Eight years ago, the CSA challenged the Army and industry to develop weapons that would make Infantry Soldiers 10X more lethal, so the Army developed and is now fielding a new rifle, which even if twice as good does not meet the 10X goal.

Concurrently, in recognition of the changing operational environment and seeing the importance of robotics in small unit operations, MCDID stood up Robotics Requirements Division (RRD) and decided to address the CSA's challenge with the 10X initiative.

Dismounted Infantry capabilities are basically unchanged since World War II and the Infantry Platoon is close to parity with enemy dismounted Infantry Platoons. 10X started with a hypothesis that there were near-term robotic technologies and AI tools that, if fielded as a system-of-systems, could make a dismounted Infantry Platoon 10 times more effective and able to make better Observe, Orient, Decide, and Act (OODA) Loop decisions 10 times faster. Note that the only requirements specified in this hypothesis are 10 times better or 10 times faster. It was up to Industry, Academia, and DoD Labs to propose specific technologies and justify how they met the 10X metric.

Concurrently to 10X, there were multiple advanced robotic and AI initiatives in the works such as:

Defense Advanced Research Projects Agency (DARPA)

Squad X to give Army and Marine Corps robotic and AI technologies to infantry squads and make them more effective — 10X is a logical extension of Squad X.

System of system enhanced small unit (SESU) to make battalion-size units at echelons above brigade significantly more effective especially to defeat an enemy's anti-access/area-denial capabilities — 10X scales the SESU concept to Platoon level.

Offensive swarm-enabled tactics (Offset) to demonstrate swarms of air and ground robots, working together to accomplish autonomous missions — 10X requires swarms of armed air and ground robots to be 10X more lethal.

DoD Close Combat Lethality Task Force (CCLTF) and the organization formerly known as the Joint AI Center were working on AI for Small Unit Maneuver (AISUM) to pull AI down to the small unit level — 10X requires AISUM capabilities as middleware to command the constellation of air and ground robots.

MCDID is collocated with the Maneuver Center of Excellence (MCoE), and now CCLTF, at Fort Benning, Georgia. The Commanding General, MCoE, was named Army proponent for Robotics in 2023, filling out a quiver of Maneuver, Infantry, and Armor (and static line parachute) proponencies, adding overmatching ammunition to the ground truth that Fort Benning IS the Center of the Universe.

In the course of the 10X initiative, we realized that the critical enabling robotic technologies were assured communications, autonomy, AI, and energy, all of which we will soon discuss in greater depth.

But we must take another side trip and talk about money, specifically the aphorism that an idea without money is a pipe dream. For a variety of reasons, the Army wellspring that had always watered good ideas dried up over the last few years. Discretionary research funding that used to be available for revolutionary ideas and technologies, especially within the Army Science and Technology enterprise, is now orders of magnitude lower.

Conversely, it is easier to fund industry to develop innovative technologies through a Government Industry Enterprise Partnership using Other Transactional Agreements (OTA). Simply put, the Government can ask an Industry Consortium to propose solutions for a specific problem, make a funding decision based on that member's proposal, transfer OTA funding through the Consortium to industry, and then receive the product from the Consortium for rapid prototype assessment or rapid fielding. The OTA process is faster and

more responsive than normal Government contracting, and Consortium members cannot protest if their proposal is not funded.

For 10X, we used the Defense Mobility Enterprise partnership between the Army Combat Capabilities Development Command's Ground Vehicle Systems Center (formerly known Tank Automotive Research, Development, and Engineering Center) and the National Advanced Mobility Consortium (NAMC)[6]. NAMC was originally named the Robotics Technology Consortium[7] when first founded but had to expand into ground mobility because the initial $1 billion Defense funding for robotics technologies quickly withered away to almost nothing per year.

10X funding was sparse, but through a Robotic Program Manager's seed funding and internal MCDID resourcing, we got through the 10X Table Top Exercise (TTX) and the SIMEXp, and then COVID stopped everything. As 10X restarted, the two 10X Technology Demonstrations in 2022 and 2024 were predominantly funded by Congressional Adds that the Columbus Chamber of Commerce proposed to Georgia Senators and were added to Defense Appropriation Acts rather than an Army budget, so the physical manifestation of the 10X SIMEXp was funded by the equivalent of a bake sale.

A half-century ago, Soldiers were taught the combat doctrine of "Shoot, Move, and Communicate." A decade ago, Mounted Requirements realized that there were key capabilities that did not fit into those three bins and expanded this doctrine to "Shoot, Move, Communicate, Survive, Sustain, and Adapt." The Joint working group assembled for the 10X TTX used this expanded doctrine to assess the technologies proposed for the 10X Infantry Platoon and select them for the 10X SIMEXp which exercised those robotic and AI technologies in a relevant, classified operational environment.

We can now look at our 10X Tank Platoon through this expanded lens:

Shoot - The mission of the Army at its most basic is to kill our enemies and break their things, so lethality is the most important combat capability. The Abrams tank was built to fire 10 Megajoule (MJ) Kinetic Energy (KE) rounds at enemy tanks on the move and with a high probability of hit and probability of kill. An Abrams tank needs intervisibility to detect, recognize, identify, shoot, and kill. Historically, a tank main gun round was designed to kill an enemy tank at its strongest point. However, a 10X Tank Platoon won't need 100 MJ KE rounds. It will need distributed situational awareness and lethality beyond line of sight, out to perhaps 20KM, with weapons that have enough energy to defeat an enemy tank, or any target, at its weakest point. The more types of smaller, lighter, cheaper sensors in that 10X Tank Platoon, the more likely it is to detect, recognize and identify the enemy tank and target its weakest point. The more armed robots you have linked to those sensors, the more likely you are to be able to focus just enough energy and momentum at that weakest point to kill the enemy tank. A current Abrams Platoon carries about 160 stowed kills, both KE and Chemical Energy (CE), so a 10X Tank Platoon needs 1,600 stowed kills spread over 10X Tanks as well as armed air and ground robots arrayed to dominate an air-ground littoral of 1,200 square KM. A 10X Tank still needs a direct-fire weapon, perhaps as a last resort, and FCS demonstrated a recoilless cannon requiring less mass to manage recoil impulse, allowing for a much smaller, lighter, cheaper 10X Tank.

Move - Armor units need to deploy strategically from where they are to the Theater they are needed in, operationally deploy within that Theater to the combat area, and then maneuver in that combat area to allow them to close with and destroy the enemy by shock, firepower, and maneuver. The first two segments penalize 75-ton tanks, and a tank you cannot deploy quickly to anywhere in the world may get there too late to make a difference. A 10X Tank Platoon needs to be strategically and operationally deployable, which means, at least until we can develop antigravity, we need multiple 10X Tanks on C-17s and the 10X Tank needs to be able to come out of a C-130 under a parachute, which drives us to a combat weight of less than 15 tons. Current Abrams tanks are capable of reaching 100 kilometers per hour (KPH) but are governed back to 70KPH. A 10X Tank does not need to travel at 1,000KPH or even 700KPH. It needs to array its constellation of air and ground robots — with appropriate multimodal sensors, weapons, and protectors — to have lethal effects on the enemy anywhere within our 1,200-square-KM area within one minute, an effective 1,200KPH speed at the edge of the 20KM-radius bubble around the center of the 10X Tank Platoon.

Communicate - There is an inverse relationship between communications and robotic autonomy. The more autonomy you have, the less communications bandwidth you need. Much of the computation for detection, recognition, and identification has to take place on the robot, further reducing spectrum load. Our 10X Tank Platoon will leverage wireless mesh, 5G/6G/FutureG cellular, and low-earth-orbit (LEO) satellite networks as part of an extended Army Network. For those of you who are naysayers about LEO satellite networks, this is the time to follow the money — the US Space Force is spending billions to field military LEO constellations. Latency, the time it takes for data to move from transmitter to receiver, will be in the tens of milliseconds, faster than a human can react. This will enable not only robotic teleoperation but also allow Soldiers who are a terrain feature or an ocean away to teleoperate crewed 10X Tanks, including weapons, 24/7 during extended campaigns, perhaps even allowing scheduled 10X Tank Platoon crew rest periods during combat — it really is a new world.

Survive - Almost three decades ago, Army Research Lab developed the concept of the Integrated Survivability Onion, which I just found out is now a meme. Its layers are, starting from the

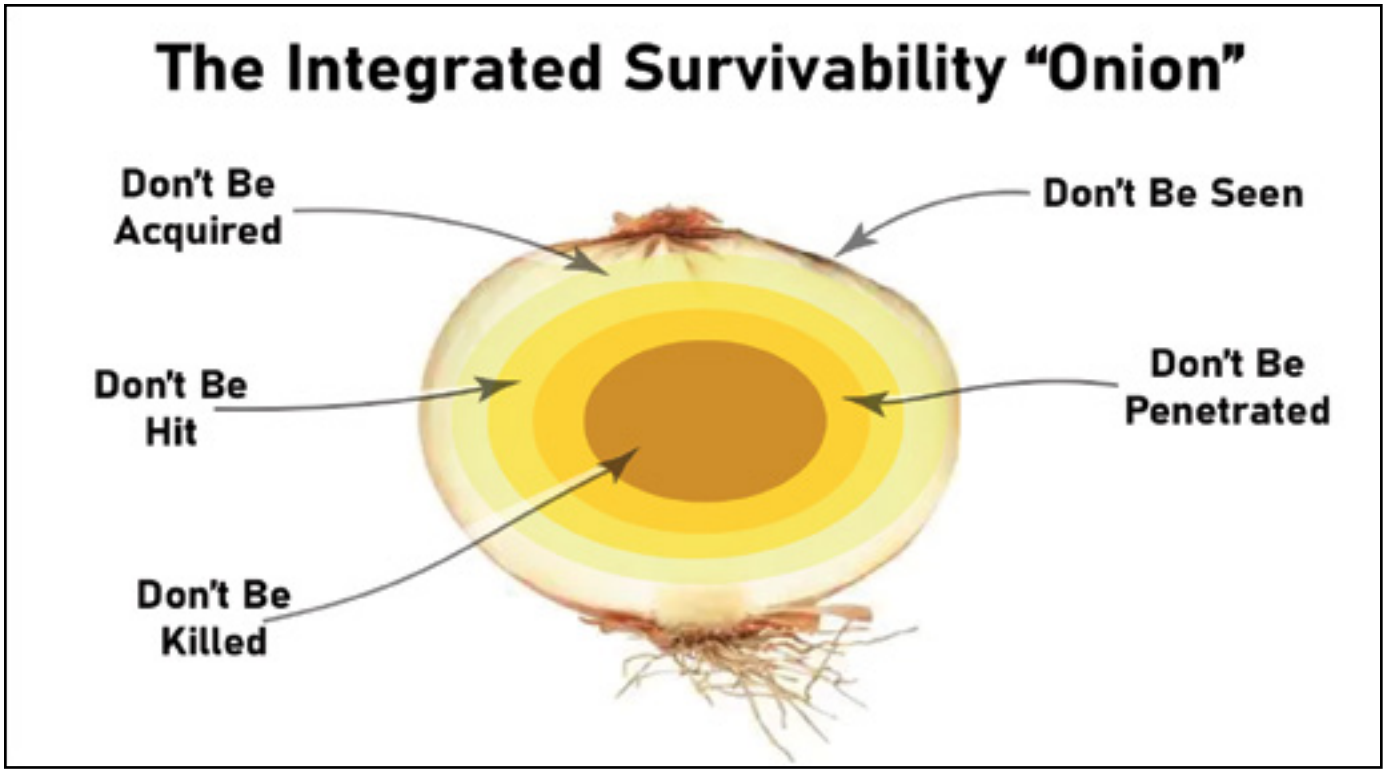


Figure 2. The Integrated Survivability Onion

inside: Don't be Killed, Penetrated, Hit, Acquired, and/or Seen. A decade and a half ago, even before Robotic Requirements was born, we realized that the Survivability Onion assumed intervisibility between you and the enemy and that if that intervisibility could be severed with robots making first contact with the enemy, then you were most survivable, so we added another layer: "Don't be There." The 10X Tank Platoon will "(Not) Be There" and will be able to maneuver out of contact, just like FCS promised. The constellation of armed air and ground robots will provide more protection than meters of Rolled Homogenous Armor Equivalent (RHAe). To address the underbelly threat resulting in fatal acceleration, autonomous active blast defeat technologies can increase the Mass Equivalency (Me) of the 10X Tank for underbelly blasts. Assuming no hull rupture, a lightweight 10X Tank can have an Me of 100 tons or more, making the crew more protected from fatal acceleration than in an Abrams.

Sustain - The 10X Tank Platoon, operating over the same time and space as an Armor Battalion, will have a logistics footprint that is also orders of magnitude smaller. Having said that, energy-dense long-chain hydrocarbons (JP8) are the lifeblood of the current Abrams and the Army at every echelon; they are also the Achilles' heel of Army logistics and a soft target of enemy interdiction. Smaller, lighter tanks need less energy, and there is interesting research going on that may allow the 10X Tank Platoon to forage for any type of liquid fuel or even biomass that can be converted to usable energy. In the mid- to long-term, the 10X Tank will get a 10 megawatt (MW) compact fusion engine (10X the Abrams turbine) installed during production with fuel to last for a decade or perhaps its useful life. 10MW allows for a power budget for directed-energy weapons, electromagnetic guns, electric armor, water generation, food generation, and exportable power.

Adapt - The Abrams is the antithesis of the Army movement towards adaptability. The 10X Tank must be designed with Modular Open Systems Architecture (MOSA) allowing plug-and-play for new and better sensors, weapons, communications, etc. The 10X Tank Platoon, with distributed situational awareness, lethality, and protection will also be plug-and-play for air and ground robots and their modular mission payloads (MMP).

Coming back to cost and weight constraints, you can fit a lot of smaller, lighter, cheaper, more adaptable 10X Tanks and robots into a $100 million, 300 ton, and four C-17 envelope.

There are some key technologies that need to be fielded, matured, or developed to realize the vision of our 10X Tank Platoon.

Drone Launch and Recovery - To be able to dominate a 1,200-square-KM battlespace, air and ground robots need to be distributed in a way that provides sufficient situational awareness and lethality to dominate the air-ground littoral. The 10X SIMEXp assumed away the technology needed for swarms of armed drones and LMs to be autonomously launched and recovered. That technology has now been developed and will be demonstrated by the end of this year. Arsenal MMPs on ground robots will carry mission-ready armed drone and/or LM cartridges allowing 24/7 combat air patrols throughout the 10X Tank

Platoon's 20KM-bubble, pushing towards the FCS goal of 100% situational awareness and enabling low-latency lethality. As drones or LMs are expended, replacements fly forward to fill the empty cartridges and are recharged while waiting for launch. The technology to autonomously rearm drones is a relatively simple engineering problem, but autonomously repairing drones will require more effort.

10X Tank Platoon Weapons - The armed drones in the 10X TTX and SIMEXp had high-energy recoilless weapons — both the Remote Operated Single Shot (ROSS) gun or the Davis gun fill the bill — with high probability of hit and high probability of kill. The 10X Tank Platoon will need smaller, lighter, cheaper anti-armor weapons in the constellation of air and ground robots, but the 10X Tank may need to have a large-caliber weapon. The 15-ton-or-less weight budget will not support current cannon technology. During FCS days, there were demonstrations of the RArefaction waVE guN (RAVEN) that decreased recoil impulse and weight and may be a large-caliber cannon technology that needs to be revisited. I am sensitive to the fact that when your 10X tank turns a corner and finds an enemy tank traversing its main gun towards you, that is not the time to wish you had a bigger, tank-killing gun. This is the kind of trade-off analysis that will be performed by Combat Developers in the 10X Tank requirements generation process.

Teleoperation - Until last year, I was absolutely certain that teleoperation of ground robots cross-country at tactical speeds and extended distances in support of a current Abrams Platoon was impossible due to latency and bandwidth, and that the path forward was to fund autonomy technology, which is what the Army is doing. However, I was convinced by a startup that my worldview was wrong, and I now believe that teleoperation is the bridging technology toward autonomous robotic and crewed ground vehicles. This capability was demonstrated a few months ago to the Army by safely teleoperating a vehicle physically in California from Michigan and Maryland, almost 3,000 miles away, on city streets in normal traffic and up to highway speeds. The combination of LEO satellites, 5G/6G/FutureG cellular networks, millimeter-wave radar, and current Army radios required for teleoperation will also provide the graceful degradation of Primary, Alternate, Contingency, and Emergency communications for the 10X Tank Platoon.

Quantum Communications - While it is currently considered impossible to communicate faster than the speed of light, the reality of Einstein's "spooky action at a distance" cracked open the door for instantaneous, distance-independent, large (perhaps effectively infinite) bandwidth, no-probability-of-detection, and no-probability-of-intercept quantum communications. And if we can transmit information, perhaps we can teleport people and equipment in the same way.

Compact Fusion - A decade ago, I visited a nuclear scientist at a company working on compact fusion with a reactor the size of a medium conference table producing 100MW. The chemistry was deuterium and tritium,

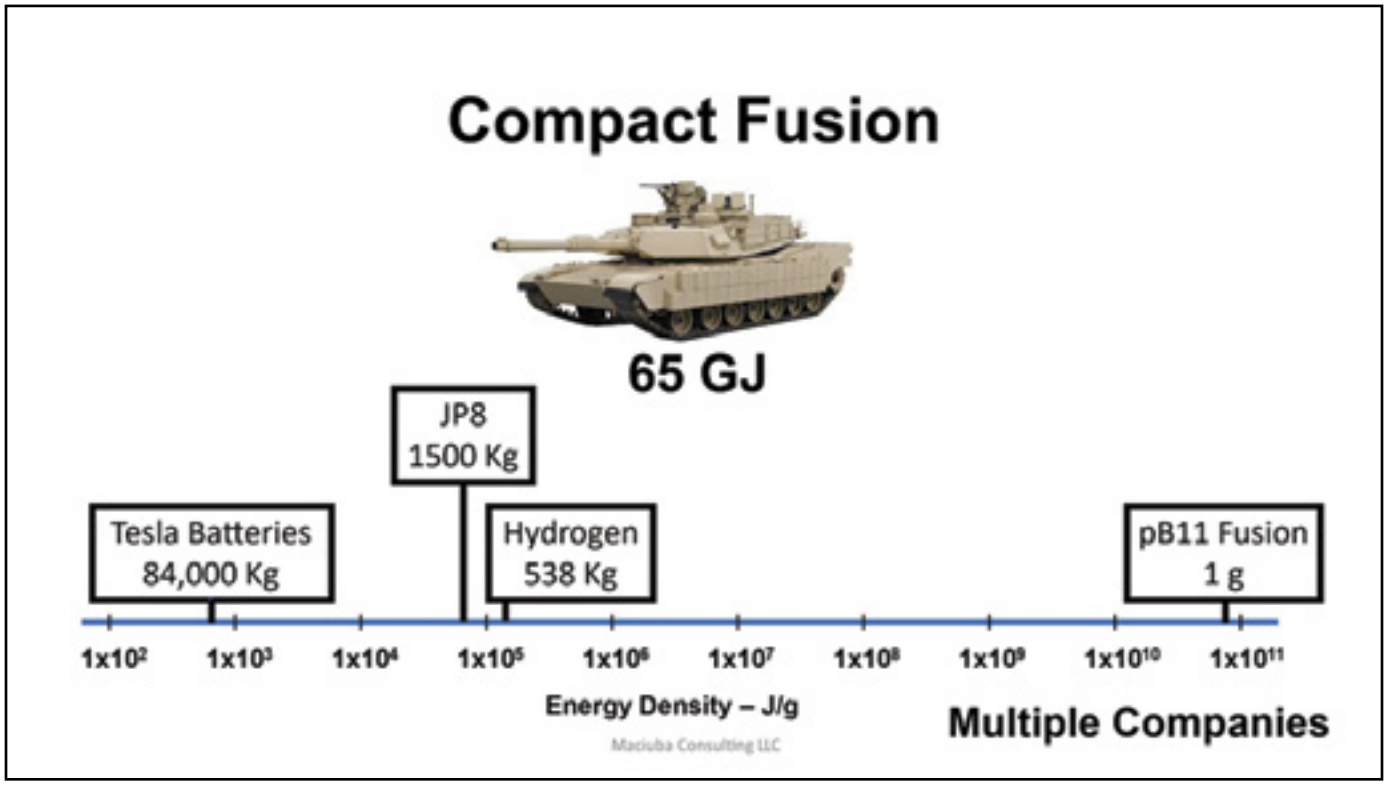


Figure 3. Compact Fusion *(Image by author)*

requiring and producing huge amounts of heat (at tens of millions of degrees Kelvin) and ending up with a helium atom and a high-energy neutron. Those pesky neutrons required dense shielding that dwarfed the compact fusion engine. I asked for a trash-can-size 10MW engine that would fit in an Abrams without shielding. A few months later, the nuclear scientist proposed proton-Boron 11 (pB11) chemistry that required an order of magnitude greater heat but ended up with four helium atoms and alpha radiation that could be shielded with a piece of paper. I called the Department of Energy expert on fusion power who told me that he had been working on fusion for 40 years and was sure it was impossible. However, the science works: We have a working fusion engine in the middle of our solar system; what we need are better materials and better ideas. So let's follow the money.[8] The private money going into fusion research is now close to $10 billion, and pB11 is one of the chemistries in the mix. Boron 11 is the most common isotope of Boron and the US is the second-largest producer in the world. A gram of Boron 11 is at least two orders of magnitude cheaper than tritium, and a gram of hydrogen is even cheaper, but the mind-blowing value of pB11 is in its energy density.

This compact fusion slide in Figure 3.shows the 65 Gigajoules (GJ) of chemical energy in an Abrams fuel tank and compares it to state-of-the-art Tesla batteries, hydrogen, and pB11 fusion on a logarithmic scale. pB11 is six orders of magnitude lighter than JP8. The smaller, lighter, cheaper 10X Tank needs a fusion engine.

Antigravity - There is a chance of leveraging our newfound knowledge about the Higgs boson to be able to counteract gravity without beating the air into submission. Two decades ago, at the Armor Conference at Fort Knox, FCS vehicles were shown in an animation just floating over the ground, without wheels or tracks. Antigravity and anti-inertia would be very interesting on a 10X Tank, for both mobility and protection.

AISUM - Finally, a 10X Tank Platoon cannot work without AI on the robots, on the network, on the 10X Tank, and on the Armor Soldier. AISUM will be the middleware between 10X Tank Platoon Soldiers and all of their equipment as it integrates air and ground robots into a system of systems at the small unit level, allows Soldiers to command robots rather than having to control them continuously, reduces network load enabling assured communications, and builds battlefield visualization that allows Soldiers to make better decisions faster.

Let's revisit our hypothesis: Can a 10X Tank Platoon, equipped with robotics and AI as described above, operate over the same time and space as a current Armor–pure Battalion?

It's time to find out. Let's build a 10X Tank Platoon in simulation and fight it against a relevant current adversary. If it's successful, then the Army should equip and crew a 10X Tank Platoon and test it in the real world.

Ted Maciuba retired in 2022 after 500 months of federal service. Beginning in 2006, Ted Maciuba served as the last Armor Center Chief of Combat Developments, responsible for Armor and Cavalry concepts, organizations, and materiel requirements at Fort Knox; stood up the Maneuver Center's Mounted Requirements at Fort Benning in 2011, developing and managing Army combat vehicle requirements (and stood it down in 2018); and stood up Robotics Requirements in 2018, developing and managing small unit robotic requirements, to include air and ground robots, artificial intelligence, and exoskeletons. A graduate of the United States Military Academy at West Point, Ted Maciuba also earned a Master of Science in Engineering degree (Operations Research and Industrial Engineering) from the University of Texas at Austin, is a licensed Professional Engineer in the Commonwealth of Kentucky, holds a commercial pilot certificate with a multi-engine helicopter rating, and now consults on robotics, artificial intelligence, and technology with industry and local government. Ted Maciuba is writing a book, "Robots in Warfare," from which this article is extracted.

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Transformation on the Frontier's Edge:
2CR's Once and Future Legacy

by MAJ Andrew Kang and MAJ Michael R. Nilsen

Since its formation in the mid-19th century, the 2d Cavalry Regiment (2CR) helped shape U.S. military history at the forefront of the nation's foreign and defense policies. From the Mexican American War to World War II, the Global War on Terror, and the more recent Great Power Competition with Russia, the Regiment consistently aligned with the nation's broader geopolitical strategies. As the sole forward-staged U.S. Stryker brigade in the European theater, 2CR fulfills strategic directives and tests new military innovations to shape Army policy and inform acquisition requirements. A look back at the nearly 200 years of the Regiment's history shows that 2CR embodies the principle that transformation occurs in contact and contact is always at the frontier's edge.

The Western Frontier: A Catalyst for Expansion and Policy

As the oldest U.S. Army Cavalry Regiment, 2CR's history has always been on the frontier of national policy. In response to the Union's expansion in the mid-19th century, the U.S. Army established the Regiment to fight in the Second Seminole War.[1] The Regiment was critical to achieving national policy in the new state of Florida through establishing stability and then shifted to expanding the Western frontier. One of its more pivotal roles came during the Mexican American War (1846–1848). Following the Thornton Affair, in which a Mexican Brigade killed or captured two troops of Dragoons, President Polk formally declared war. During the Battle of Resaca de la Palma, despite being outnumbered nearly four to one, the Regiment successfully turned the tide of the battle. Captain May rallied his Dragoons with the cry, "*remember your Regiment*," and led a charge that captured the Mexican general and his artillery. This victory allowed the U.S. Military to gain and maintain momentum both at home and abroad, contributing to the eventual defeat of Mexico.[2]

2CR continued this trend through both the Civil and Frontier Wars. During the Civil War, 2CR earned 14 campaign streamers and celebrated five Medal of Honor recipients. The Regiment's actions proved crucial during the Battle of Gettysburg, where their delaying tactics allowed the Army of the Potomac to secure key terrain, altering the course of the war. On the Western Frontier, the Regiment executed dispersed operations to protect settlers, with 15 Dragoons earning the Medal of Honor—the highest number in any conflict for the Regiment. Without the Regiment's efforts to support the Nation's western expansion, the United States would not be what it is today.[3]

World Wars and Interwar Period: Transforming in Contact

After quelling insurgencies in the Philippines and stabilizing the southern border with Mexico, the Regiment prepared for World War I. As the only U.S. Cavalry Regiment to fight in the war, 2CR transformed in contact by changing its structure, tactics, and employment based on lessons learned from

Figure 1: PVT Williams, 2CR with his Rifle. 2CR proved that cavalry tactics with a little innovation were not dead but rather game changing.

Figure 2. Iraqi T-62 main battle tanks destroyed during Operation Desert Storm. *(Image by the National Archives, Washington D.C)*

the early stages of war. Instead of executing large, brigade-level frontal assaults common among French and British forces during 1914-1916, 2CR leveraged its strengths through rapid, decentralized strikes. These strikes, conducted with troops and smaller units, aimed to shock enemy forces in the Axis' rear area. Unlike European armies, which considered it dishonorable to dismount during battle, 2CR leveraged the American Soldier's cowboy spirit. Dragoons demonstrated incredible lethality and adaptability as they fought both mounted and dismounted and employed experimental weaponry like the Browning Machine Gun and radio. Furthermore, Dragoons acted as a long-range reconnaissance for Allied Forces and as an essential command and control asset by leveraging their speed to deliver critical messages between Allied headquarters.[4]

In World War II, 2CR once again found itself at the forefront of American military strategy. With the United States entering the war following the attack on Pearl Harbor in 1941, the nation had to rapidly adapt its military force to meet the demands of the changing nature of warfare. While traditionally a cavalry unit that relied on horses, 2CR found itself transforming in contact with new technologies and a mechanized form of warfare. 2CR played a critical role in key Allied operations during the war, including the D-Day landings and the subsequent advance across Western Europe. Their performance demonstrated the United States' ability to deploy and sustain military forces across vast distances. This success further established the United States as a key player in maintaining global security. The Regiment's shift from traditional cavalry to armored vehicles symbolized the transformation of the U.S. military, emphasizing mobility, rapid response, and flexibility, principles that would continue to inform U.S. military policy in the decades that followed.

Post-War Cold War and Beyond: A Continued Global Presence

Following World War II, 2CR played a key role in the U.S. strategy of containment during the Cold War. Stationed in Germany as part of NATO's defense strategy, the Regiment's mission was to delay any advance by the Soviet Union. Their presence in Europe highlighted their continuing relevance in global military policy, reinforcing the strategic importance of rapid deployment forces. 2CR's operations during this time were crucial in maintaining the balance of power between East and West, reflecting the United States' broader approach to managing the global order.

After successfully containing the Iron Curtain, 2CR was instrumental in the Battle of 73 Easting, or the last great tank battle of the 20th Century. Acting as VII Corps' cover force during the Desert Storm ground campaign, 2CR destroyed four Iraqi Armor Brigades established in a fortified defense within 24 hours.[5] This included when CPT McMaster destroyed an Iraqi Armor Battalion within the first 23 minutes. With Iraqi Republican Guard's defense disrupted, 2CR punctured over 160 miles and captured an additional 2,000 Iraqi prisoners. Much of these operational effects were also due to 15 years of transformation after Vietnam. New technologies like GPS or the Big 5 (Abrams, Bradley, Apache, etc) gave 2CR and US forces a decisive edge over the Republican Guard. This set conditions for XVII Corps to collapse the Iraqi Western line and the Coalition to push through to liberate Kuwait.[5]

As the world changed after 9/11, 2CR also transformed to meet it. After being instrumental to the invasion of Iraq and capture of Sadr City, 2CR transformed from an armored cavalry regiment to a newly created Stryker

Figure 3. A bronze plaque explaining the history of the Battle of 73 Easting is unveiled at Rose Barracks, Germany. *(U.S. Army photo by SGT William Tanner)*

brigade combat team. Over the next decade in contact, 2CR validated the medium based formation while deploying four times to the frontier's edge of foreign policy in Afghanistan and Iraq. This included two 15-month deployments to Iraq to build host nation combat power and defeat over 2,000 enemy insurgents. This eventually led to the Sunni Awakening. As for Afghanistan, 3rd Squadron employed its strategic mobility to great effect during Operation Dragon Strike, resulting in International Security Assistance Force (ISAF) and Afghan National Defense and Security Forces (ANDSF) recapturing Kandahar from the Taliban.[6]

Back to the Future: Frontier's Edge of Innovation in the 21st Century

With the return of Great Power Competition in Europe, 2CR once again finds itself on the frontier's edge of NATO's eastern flank. In response to the Russian Ukrainian conflict, NATO leadership announced during the 2022 Madrid Summit its new Force Model. This Force Model employs battalion-sized battle groups designed to episodically scale up and form Forward Land Force (FLF) brigades for increased assurance and deterrence.[7] Informed by the ongoing conflict with Ukraine, 2CR has been steadily driving experimentation to generate the innovation requirements and force structure redesign that will enable the U.S. Army to continue providing the joint force with exceptional capability in the European theater. As the only forward-staged Stryker brigade combat team and transforming-in-contact (TiC 2.0) designated unit, 2CR represents the convergence of innovation and interoperability as the U.S. continues to support European security through agile, adaptive, and interoperable command and control (C2). In recent years, 2CR has demonstrated this capacity through multiple NATO exercises with an emphasis on the Core 4: secure chat, voice communications, a common operational picture (COP), and collaboration (Maven Smart System, Teams, or another Joint All Domain System).

During *Griffin Shock 23*, a combined NATO and U.S. exercise in Poland, 2CR rapidly expanded NATO Multinational Battlegroup Poland, leveraging Maven Smart Systems and the Nett Warrior Tactical Assault Kit (TAK) to create a unified Common Operational Picture (COP). The agile and adaptive C2 network enabled the Regiment to rapidly execute a 1,200 km tactical road march to surge a 1,000-person NATO Battle group to a 5,000-person multinational task force within five days. Leveraging the sensitive but unclassified-encrypted (SBU-E) network enabled implementation of the Core 4 C2 functions to a top tier while fostering integration with NATO Allies. A year later, the Regiment repeated this success on a larger scale. The task force surged to over 10,000 personnel from 12 nations within seven days during *Saber Strike 24*. Effective communication was crucial for success during the exercise. The Task Force utilized tools like AWS Wickr and Mission Partner Kits (MPKs) to integrate liaison officers (LNOs) with the NATO Multinational Battle Group. This streamlined communication enabled the Task Force to overcome challenges and achieve its goals.[8]

Conclusion: 2CR's Legacy at the Frontier's Edge

From the Mexican American War to World War II, and through its modern-day deployments, the 2d Cavalry Regiment has been continuously stationed at the frontier's edge of U.S. national policy. Its history reflects the evolving strategies of the United States as it navigated territorial expansion, global conflicts, and the complexities of international diplomacy. The Regiment's legacy is one of continuous transformation in service of a constantly developing national policy. 2CR has always and will continue to play a pivotal role in the shaping of the future of global security.

Figure 4. U.S. Soldiers assigned to Lightning Troop, 3rd Squadron, 2nd Cavalry Regiment, NATO Multinational Division Northeast, engage targets using a Stryker armored vehicle. *(U.S. Army National Guard photo by SGT John Schoebel)*

Major Andrew Kang currently serves as the S3 for Field Artillery Squadron, 2d Cavalry Regiment,

stationed at Rose Barracks, Germany. Previously, MAJ Kang was a student at the U.S. Naval War College and served as an Aide-de-Camp to the Commanding Generals of both XVIII Airborne Corps and the 82nd Airborne Division at Fort Bragg, North Carolina. MAJ Kang also commanded Headquarters and Headquarters Battery, 3rd Battalion, 319th Airborne Field Artillery Regiment, 1st Brigade Combat Team, 82nd Airborne Division at Fort Bragg. Major Kang's military education includes courses in joint fires, airborne operations, and field artillery leadership, and MAJ Kang holds a Bachelor of Arts in Psychology from the University of California Los Angeles and a Master of Arts in Defense and Strategic Studies from the U.S. Naval War College. MAJ Kang has been awarded the Meritorious Service Medal and is originally from Los Angeles, California

Major Michael R. Nilsen currently serves as the executive officer for 3rd Squadron, 2d Cavalry Regiment. MAJ Nilsen's next assignment is the future First Army Commanding General's Aide-de-Camp. Prior to the 2d Cavalry Regiment, MAJ Nilsen served in the XVIII Airborne Corps and 2nd Security Force Assistance Brigade. For the last seven years, MAJ Nilsen has contributed to campaign objectives in two theaters, and spearheaded significant innovations for multiple military units. Additionally, MAJ Nilsen holds a bachelor's in Sociology, Arabic, and Systems Engineering from the U.S. Military Academy, and a master's in strategic studies from Command and General Staff College.

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Figure 5. An AH-64 Apache attack helicopter fires as M1A2 Abrams tanks maintain fighting positions on range 11 at a combined arms live fire exercise. *(U.S. Army photo by SFC Robert Jordan)*

Interwar Mechanization to Transformative Robotization

U.S. Army photo by SPC Samarion HIcks

by Kasey O'Donnell

Introduction

History suggests that the winner of the next fight will be the country who determines the most effective employment of a technological advance – such as robots and autonomous systems -- vice the inventor or an early adopter.[1] Winning this race requires a clear tactical or operational problem to solve, a rapid iteration cycle, and a willingness to drive the technological leaps between the developers and Army formations. Today's challenge is not unlike one that the Army has faced before. Between 1923 and 1943, the U.S. Army developed 51 light and 38 medium Tank variants in partnership with U.S. industry to drive the capability leaps needed to go from a Renault light tank at the end of World War I to the M4 Sherman workhorse of World War II.[2] The Army's current efforts to field and integrate robotics, particularly through platform testing, software development, and synthetic training environments, resemble the challenges and arguments encountered during the mechanization of ground forces in the 1920s and 1930s. This article examines historical parallels with a focus on force structure, employment concepts, and the broader implications of innovation under conditions of doctrinal uncertainty – the key point being that innovation doesn't just happen, it must be driven.

The Interwar Period and the Challenge of Mechanization

The initial introduction of tanks during World War I occurred under experimental conditions. Early models like the British Mark I and the French Schneider CA1, struggled with mechanical reliability and lacked coordination with infantry forces. Despite these issues, these platforms highlighted the need for armored mobility to break away from the grueling stalemate of trench warfare. By the end of the war, American tank forces had formed under Col. Samuel Rockenbach, participating in limited but significant combat at St. Mihiel and Meuse-Argonne with borrowed French Renault FT tanks.[3]

The interwar period saw global divergence in how tanks were integrated into doctrine, force structure, and design. In the United States, despite postwar enthusiasm for the role armor might play on the battlefield, the National Defense Acts of 1920 and 1921 imposed significant budgetary and personnel constraints. U.S. tank development focused primarily on light tanks, notably influenced by the Renault FT's layout. However, no consensus emerged on whether tanks were infantry support assets, independent maneuver tools, or something else entirely.[4] Interestingly, critiques of these first

Figure 1. Mechanized and mounted cavalry units participated in maneuver training. This image captures one of the few tanks deployed in support of interwar training activities.

Figure 2. 10th Sustainment Brigade Soldiers learn to operate the PackBot during training at Bagram Air Field, Afghanistan *(U.S. Army photo by SSG Cory Thatcher)*

mechanized tanks described them as "noisy and overheated easily, its speed was 5.5 miles an hour" and weighed roughly 7.25 tons which parallel many of the entry level ground robots from 2020 until now.[5]

Meanwhile, Germany, though constrained by the Treaty of Versailles, began developing an armored doctrine covertly in collaboration with the Soviet Union. German Gen. Heinz Guderian emphasized the integration of communications, maneuver, and command into mechanized formations to enable rapid maneuver and overcome the superiority of the defense in World War I. Germany pioneered the use of 3-person turrets and radios, facilitating rapid tactical decision-making—a doctrinal edge revealed dramatically in Poland and France in 1939–40.[6]

Britain and the Soviet Union took more divergent paths. U.K designs including variants such as the Vickers Mediums and the multi-role cruiser/infantry tank, as the British Army struggled to produce a coherent armored doctrine. Soviet interwar development produced heavy multi-turreted tanks like the T-35 and an ambitious theory of Deep Battle, but political purges undermined its application in practice.[7]

This lack of doctrinal consensus—combined with diverse technological experiments—resulted in a spectrum of tank designs, employment concepts, and organizational structures by the outbreak of World War II. The Germans, who optimized their tank development to solve the maneuver problem, began the war with an overwhelming advantage.

Robotization: A Modern Analogue

Robotics within the U.S. military emerged gradually, often isolated in specialized domains. As early as 1946, discussions referenced remote-controlled vehicles, and by the 1960s, Defense Advanced Research Projects Agency (DARPA)-led projects began exploring basic robotic autonomy. The development of "Shakey" in the 1970s represented a milestone: it was the Army's first robot capable of limited planning and decision-making using onboard sensors and logic.[8]

The 1980s saw more robust programs such as the autonomous land vehicle (ALV), a wheeled robot equipped with sensors and cameras for autonomous off-road navigation. Despite the technical promises, these platforms were constrained by computational limitations of the time period. Obstacle avoidance, real-time processing, and battlefield survivability proved elusive.[9]

Unlike interwar tanks, which were prominent symbols of national power and military theory, robotic systems remained within the science and technology (S&T) realm, distant from the operational concerns of force planners and lacking a clear tactical problem to solve. The limited adoption of unmanned systems during the Gulf War and the early 2000s reflected this detachment—platforms existed, but without an accompanying doctrine or training framework for their integration into maneuver forces.

Institutional Experimentation and Robotics

During the Global War on Terror of the early 21st century, the Army began to integrate robotic platforms more deliberately. Remote-controlled explosive ordnance disposal (EOD) robots like PackBot and TALON became standard equipment. These systems, though unarmed and teleoperated, demonstrated the potential for robotics to save lives by reducing Soldier exposure to high-risk tasks.[10]

The 2010s brought greater investment in autonomy. Programs like the small multipurpose equipment transport (SMET) robot were developed to support small unit logistics and reduce the loads carried by dismounted squads. The Army also explored utilizing mounted robotic platforms for reconnaissance, including M113-based surrogates equipped with sensors and communications payloads.

The robotic combat vehicle (RCV) concept grew out of these efforts. Soldier operational experiments at Fort Carson and Fort Hood used modified platforms in live scenarios to evaluate ground robots utility in reconnaissance, security, and fires integration in an attempt to limit Soldier risk at the point of contact with the enemy. In parallel, Project Convergence—a joint modernization initiative designed to aggressively advance and integrate the Army's contributions to the Joint Force—evaluated human-machine teaming using live and virtual test

environments.[11] Project Convergence (PC) originated from a need to rapidly integrate AI and sensors/shooters – to solve the practical problem of faster, more effective target engagement. The initial phases focused on establishing and demonstrating the feasibility of linking these systems. As the project evolved, expanding to include international partners, it consistently emphasized refining interoperability and gathering data – mirroring the iterative development process that was essential to the technological advancements of interwar mechanization.

These layers of experimentation—live testing, synthetic environments, and software-in-the-loop simulations—represent a shift from S&T isolation to institutional engagement. However, as in the interwar period, experimentation is occurring in the absence of universal consensus regarding employment or a clear problem to solve, organization design, or a concept for training pipelines.

Comparative Roles and Institutional Integration

One of the clearest historical parallels between interwar tank development and the emergence of robotic and autonomous systems lies in the ambiguity surrounding battlefield roles and organizational placement. In the 1920s and 1930s, the U.S. military struggled to define where tanks belonged within the force structure. The National Defense Act of 1920 formally placed tanks under the control of the infantry, reinforcing the concept of armor as a support asset rather than a holistic maneuver element.[12]

Tank design reflected this doctrinal uncertainty. The M1 and M2 light tanks prioritized speed over protection or firepower, optimized for reconnaissance and exploitation but not direct confrontation with enemy armor or anti-tank weapons. U.S. light tanks such as the M3 Stuart performed in roles consistent with this doctrine—especially in the Pacific and early North African campaigns—but were outmatched when tasked with confronting German Panzer III and IV tanks, and Pak 40 anti-tank guns in direct combat. This mismatch revealed the consequences of designing platforms without a settled operational concept and resulted in less effective technological leaps than the German Army, which optimized around a clear problem.

Similar doctrinal and employment debates extended beyond the U.S. Army. In Britain, conflicting concepts of "infantry tanks" and "cruiser tanks" led to fragmented development. The Soviet Union pursued bold theoretical frameworks like Deep Battle but struggled to implement them consistently. Germany's eventual adoption of integrated armored formations—anchored by clear doctrinal principles and a flexible command structure—emerged as the exception rather than the norm.[13]

Modern robotic and autonomous systems face a comparable institutional challenge. While technological experimentation is advancing rapidly—through efforts like Project Convergence, Human-Machine Integrated Formations, and integration into synthetic training environments—the placement of robots within the Army's operational force structure remains unsettled. Constructive debate continues over optimal payloads, tactical problem focus, and at what echelon robots will integrate with dismounted and mounted maneuver units, and what level of tactical autonomy is acceptable in contested environments.[14]

Like the interwar tank, U.S. robot employment to date has focused on enabling manned formations supporting reconnaissance, logistics, breaching, or limited security roles. Although future concepts for the Army require it, current employment has yet to reach the point of reshaping operational doctrine or prompting reorganization of the combined arms team. This is not necessarily a failing; rather, it reflects the same iterative, uncertain process that characterized interwar mechanization. Overcoming these obstacles and achieving the technological leaps to achieve robots with which the Army can win requires coalescing efforts around critical tactical problems, designing a path that enables rapid robotic advancement between industry and the government, and continued experimentation and evaluation under realistic conditions.

International Context: Divergence and Convergence

Just as the interwar years witnessed divergent tank doctrines across the globe, modern robotic development reflects a range of national approaches. Ukraine has employed unmanned ground systems for surveillance and

Figure 3. The Maneuver Innovation Lab hosts an open house at Fort Benning, GA. *(U.S. Army photo by Daniel Marble)*

explosive delivery over short ranges on a fixed front, often in improvisational ways driven by battlefield necessity. Israel has developed semi-autonomous border patrol systems, as well as unmanned variants of armored fighting vehicles for urban combat in Gaza.[15]

Russia's Uran-9 and China's Norinco Sharp Claw systems illustrate varying degrees of autonomy and doctrinal clarity. Many of these platforms remain in developmental stages or are deployed for narrow mission sets to solve current tactical problems. Overall, global militaries are experimenting without universal agreement on design, force structure, or employment, just as they had in the 1930s.[16]
The United States has opted for an incremental and layered approach—pairing prototype platforms with iterative field experiments and cross-branch collaboration, a strategy reminiscent of the extensive experimentation with armored vehicle designs between 1923 and 1943. It took 20 years to evolve from the limited capabilities of the post-WWI Renault FT to the M4 Sherman. This deliberate pace now seen in the realm of robotics and human-machine integrated formation (HMIF), while potentially slower than outright adoption, is informed by the lessons of history: the premature fielding of unproven systems as seen with early tank designs that were ill-suited for direct combat, risks ineffective capabilities when rigorously testing. Today's process, demonstrated though initiatives like Project Convergence, follows the essential drive of the mechanization era.

Conclusion

The interwar period offers more than just a historical comparison for the U.S. Army's engagement with robotic systems. It provides a structural analogue—one in which technological possibility outpaces institutional understanding. The parallels between interwar mechanization and the current drive toward transformative robotization are striking. Just as in the 1920s and 30s, the U.S. Army finds itself navigating a landscape where technological possibility outpaces institutional understanding. The development of tanks then, and robotic systems now, demonstrates that innovation alone is insufficient for victory. To truly win this race and determine the most effective employment of robots will require a clear tactical or operational problem to solve, a rapid iteration cycle fueled by continuous experimentation and data analysis, and a deliberate willingness to drive the technological leaps between developers and Army formations. The Army's current layered approach, mirroring the extensive experimentation with tank variants in the interwar years, reflects a recognition that progress isn't about simply building robots, but about systematically refining them through rigorous testing and integration. Like the interwar period, we are not waiting for the "perfect" system to emerge but actively shaping robotic development to solve defined tactical problems and ensure they contribute to a cohesive, and ultimately, winning force. This commitment to rapid iteration, embracing failure as a learning opportunity, and bridging the gap between technology and operational needs is the key to unlocking the full potential of robotic and autonomous systems and securing a decisive advantage on the future battlefield.

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NOTES

1 For the purposes of this article, the word "robots" can refer to any autonomous or semi-autonomous system designed to support a Human-Machine Integrated Formation.

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Combined Arms in Urban Operations: Insights into ATP 3-06.11

by CPT Logan S. Yates

While serving as a platoon leader in the 11th Armored Cavalry Regiment (ACR), I taught a class on strong points in an urban defense. As a Blackhorse trooper with the 11th Armored Cavalry Regiment, my primary responsibility was to lead an opposing force (OPFOR) platoon through ten rotations annually against rotational training units (RTUs) at Fort Irwin, California. After completing 20 rotations, I gained experience in military operations in urban terrain (MOUT) while training at premier urban facilities like Razish.

The class I taught supported the second Urban Operation Planners Course (UOPC), organized and hosted by the 40th Infantry Division. It was a valuable experience, where I had the opportunity to meet senior officers from US Army units and allied nations all attending as students. While leading this class, I worked with personnel from the National Training Center Operations Group (Ops Group).

Two years later, I had the opportunity to revisit NTC again, this time as a student of UOPC. The UOPC curriculum, combined with my practical experience as an OPFOR, validated my understanding of combined arms operations in urban terrain.

These experiences revealed a knowledge and training gap within brigade combat teams regarding combined arms urban operations. The Army has made recent headway with the publication of army training publication (ATP) 3-06.11, *Brigade Combat Team Urban Operations*. This publication supersedes ATP 3-06.11 published in 2011.[1] The earlier publication opened with the statement that urban operations are "infantry centric." While relevant to the counterinsurgency era when it was published, this statement underscores the need for updated urban operations doctrine.

While attending UOPC, a common trend conveyed by the observer controller/trainers (OC/Ts) at Fort Irwin was that RTU struggled to employ combined arms in urban terrain. This information suggests that RTUs are not incorporating sufficient training at home stations to prepare for urban environments. On the other hand, units that would use armor and engineers with infantry have experienced success attacking Razish.

The Ukrainian War and the Israel-Hamas War demonstrate that simply bypassing a city is not always feasible or desirable. OOn the operational and strategic levels, urban centers often represent the "heart and guts," as described by 16th-century French commander Marshal de Tavannes.[2] History has shown that a Nation's capital may be a center of economic, political, and cultural gravity and that controlling that capital is vital to controlling the nation or population.

On the tactical level terrain, lines of communication (LOCs), population control, and actor attitude all play a role in whether fighting should occur in a city. Moreover, tactical units will encounter a wide range of cities varying in urbanization complexity.[3]

In essence, the complexities of the urban environment are increasingly prevalent on today's battlefields. In this paper, I will provide insight into the newly published ATP 3-06.11 and how the principles shared in this publication are relevant to how we equip and train our armored brigade combat teams (ABCTs) at the tactical level. In this endeavor, I also draw upon case studies from the current conflict in Ukraine, lessons shared from UOPC, and practical experience I gained while assigned to 11ACR.

Doctrinal Overview

The newly published ATP 3-06.11 builds upon the foundational urban doctrine of ATP 3-06. Yet, this most recent doctrinal publication narrows the scope of urban operations as it applies to today's brigade combat teams (BCTs). A quality publication, this doctrine starts with a broad overview of the urban environment and then transitions to operational approaches for the offense, defense, stability, and enabling operations in the urban environment.

One of the unique additions into this publication is the presentation of fundamentals for urban operations:[4]

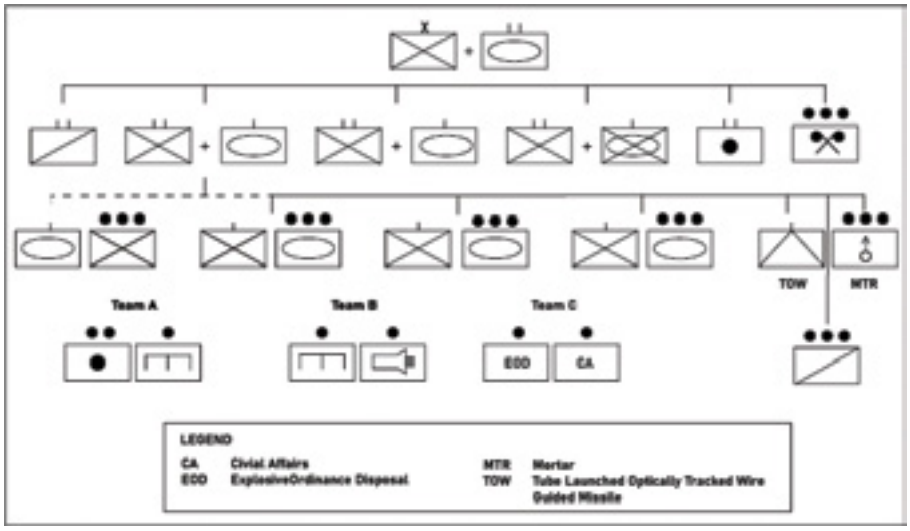

Figure 1. Combined Arms Task Force *(U.S. Army Graphic)*

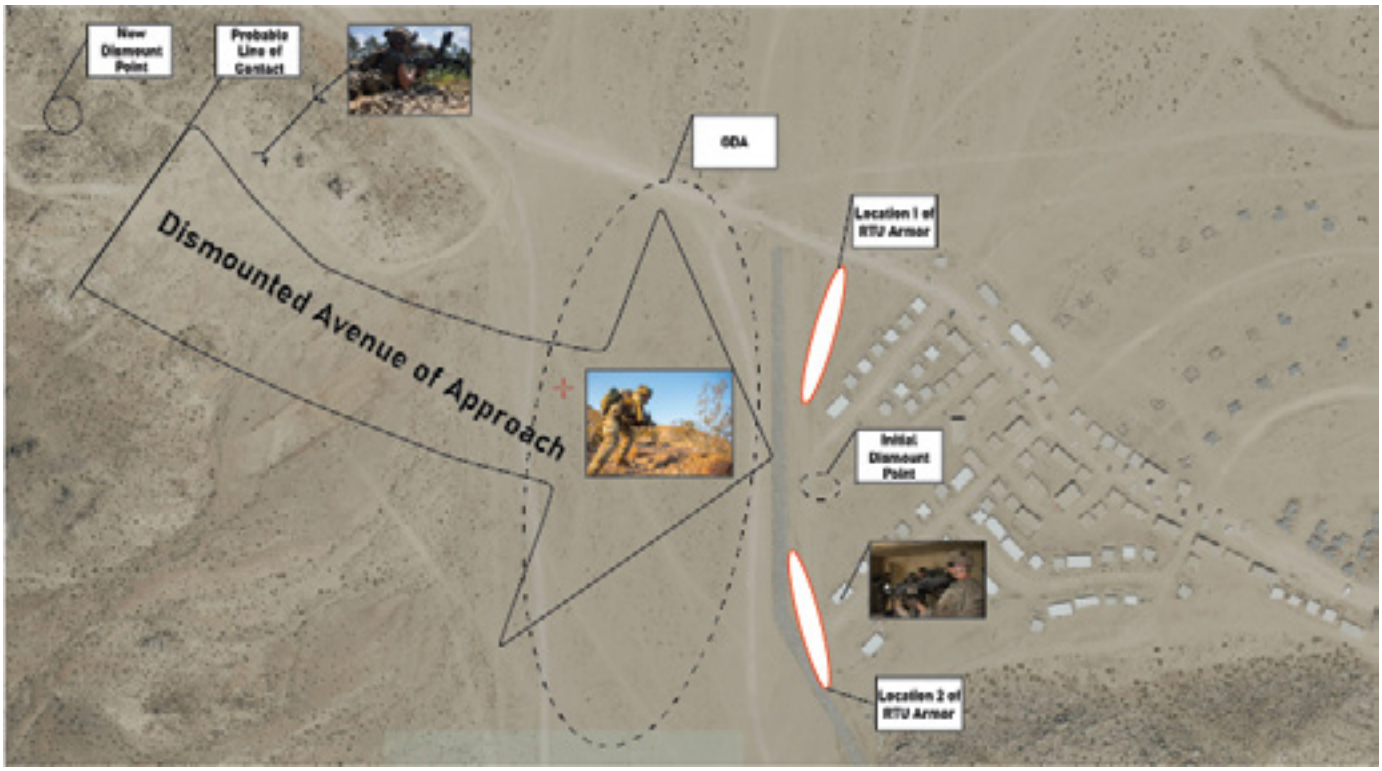

Figure 2. This graphic illustrates the sequence of events necessary to attack and occupy a prepared defense in an Urban environment. *(Photo by CPT Evan M. Cain, 11th Armored Cavalry Regiment).*

1. Employ forces as combined arms teams.
2. Control the essential and leverage urban systems.
3. Manage the population.
4. Isolate threats.
5. Reduce collateral damage and maintain the integrity of urban systems.
6. Create a collaborative environment.

While all these fundamentals apply to today's ABCT, analyzing all these fundamentals are well beyond the scope of this paper. Therefore, the following discussion focuses on three of these six fundamentals: employing forces as combined arms teams, managing the population, and isolating threats. I have chosen these three principles from the others, as these principles can more easily transfer from the higher headquarters of a brigade down to the company and platoon level of combined arms teams. Additionally, these fundamentals can be resourced at most home station military operations in urban terrain (MOUT) sites.

Employing Forces as Combined Arms Teams

The first fundamental of urban operations, employing forces as combined arms teams is essential for success in an ABCT. The urban environment places more constraints on military units than any other operational environment. In addition to the three-dimensional physical surfaces of the urban environment, population and infrastructure must also be considered when task organizing combined arms teams. Chapter 2 of ATP 3-06.11 presents the following example of how a brigade combat team CAN be task organized.[5]

Figure 1 illustrates the integration of armor, infantry, engineers, fires, explosive ordnance disposal (EOD), information operations, and civil affairs at the company and platoon levels. While this graphic serves as an example for task organization, Chapter 2 continues to outline ways to task organize down to platoons and sections. The urban environment necessitates a different task organization for brigade combat teams. The following vignette provides an example of how to complete this task organization.

Armor Integration

During Rotation 21-10, Easy Troop, 11 ACR was tasked to counterattack the RTU that previously seized Razish from defending forces in the city. The Troop's primary avenue of approach was from the West moving through the well-known Peanut-Chod Hill gap. During the planning and preparation phase, Easy Troop received one main battle tank (MBT) to cover the dismount and movement into the city. The size of the troop consisted of roughly 100 dismounted infantrymen, just short of a full infantry company.

Shortly after departure, Easy Troop conducted battlefield hand off and discovered that RTU forces had emplaced

two platoons of Abrams and Bradleys on the western portion of the city. This new information forced Easy Troop to dismount one kilometer west of the originally planned dismount point. To further complicate the troop's attempt to reseize the city was the presence of a large-open danger area (ODA) between the new dismount point and the first enemy battle position. To enable Easy Troop's movement across this ODA, the unit emplaced their weapons squad with M240 and Javelin teams. After the weapon's squad was emplaced, the troop commander called forward the attached MBT to suppress the enemy armor on the objective and facilitate movement across the ODA. While the use of machine gun and Javelin teams made a difference in their ability to gain a foothold in Razish, it was the presence of the MBT and the proficiency of the crew which made the biggest difference in Easy Troop's survivability, allowing a successful counterattack of the city. The employment of the MBT in this fashion showcased one of the main employment roles of armor as described in ATP 3-06.11.

Easy Troop only requested one MBT in support of the dismount and seizure of Razish. Had the presence of enemy armor on the objective been known sooner, Easy Troop could have requested a section or more of MBTs. ATP 3-06.11 describes the utility of armor to allow infantry to cross large openings within urban terrain and destroy enemy armor and strongpoints.[6] This ad hoc task organization down to the section and platoon level is a major characteristic of urban combined arms task organization and should serve as an option in a commander's tool kit.

While this vignette highlights the ability that armor can enhance urban offensive operations, the same could be said for RTU in the defense who integrated armor into their defensive battle positions. This integration successfully thwarted Easy Troop's ability to dismount on the objective by forcing them to dismount well before the desired position. Additionally, RTU successfully delayed Easy Troop's ability to quickly seize a foothold in the city which cost precious time in their operation.

Easy Troop employed similar tactics during rotation 22-02 in which they integrated armored personnel carriers (APCs) and MBTs into the main city defense. This scenario forced Easy Troop to be more deliberate in the emplacement of armor within Razish by constructing hide positions between buildings and planning well-rehearsed battle position occupations to prevent early detection of armor within the city. By integrating armor into their defense, Easy Troop was able to achieve greater stand-off, rate of fire, and mobile protection, allowing preservation of resources and infantry combat power to concentrate as fighting moved further into the city.

Other Enablers

Alongside these examples, other enablers can and should be integrated within urban operations. Electronic warfare directional locating teams can

Figure 3. Soldiers with the 1st Armored Brigade Combat Team, 3rd Infantry DIvision, scan a simulated village with a Bradley Fighting Vehicle at the National Training Center. *(U.S. Army Photo by SPC Rebeca Soria)*

be an effective attachment to the maneuver company by providing real time tactical information and refining enemy locations in the urban space. Engineers are also essential in successful urban offensive and defensive operations. The assistance of engineer bulldozers and lift assets from forward support (FSC) companies are essential to build and establish a strong obstacle effort.

In the urban environment, the maneuver commander must deliberately consider all task organization options and tailor them to the mission. This vignette also illustrates the possibility of pushing down assets held at the Battalion and Brigade level to company teams. The next example showcases the need to task organize other enablers not mentioned in this section, such as civil affairs, multi-function teams (MFT), and Psychological Operations (PSYOP) teams.

Manage the Population

ATP 3-06.11 describes several threats and complications presented to the maneuver commander through the mismanagement of population.[7] Internally displaced civilians (IDPs) can greatly outnumber military forces operating in the urban environment. The flow of IDPs out of contested zones may fall under the purview of Battalions and Brigades and failure to do so can wreak disastrous consequences to company level tactical units. Failing to direct IDPs can lead to looting, rioting, and other civil disturbances, which can impact military operations. Additionally, the proliferation of cellular devices and social media can place tactical actions on the world stage, forcing the need for brigades to also consider continuous Information operations.

The doctrine later outlines how information collection teams, in the form of HUMINT, SIGINT and other teams should be incorporated in shaping the urban environment for decisive urban operations. Additionally, attaching military information support operation teams, in the form of PSYOPs and Civil Affairs can assist in communicating with the local population.[8] Use of loudspeakers, pamphlet drops, and civil reconnaissance can help with restricting inhabitants to home or central locations, searches, and coordinating the movement of IDPs.

During NTC Rotation 22-02, higher headquarters directed Easy Troop to incorporate a large population of civilian role-players into the Razish defense to present a complex training scenario for RTU. To further complicate preparation for this operation, HQ also directed Easy Troop to defend Razish for an uncommonly extended period. Acting as an indigenous fighting force, the troop commander factored in the time tasked to defend with the composition and the size of the objective. Considering these operational constraints, Easy Troop chose to leverage the civilian role players by tasking them to lead a protest as RTU attempted the breach of the city.

What followed was a dramatic lesson of needing information collection teams and civil affairs integrated with ABCTs prior to conducting urban operations. By sending several dozen civilian role players to disrupt RTU as they attempted to breach the city, Easy Troop dramatically enabled information operations and thwarted the ability for the RTU to engage hostile forces. If the RTU properly conducted shaping information and civilian harm mitigation operations, maneuver units would have more freedom to operate unhindered.

Commanders should consider what civilian harm mitigation strategies have already been taken prior to entering an urban area. This information can be essential when deciding what avenues of approach to direct military forces to use. Understanding shaping information operations can also help commanders understand the attitudes and opinion of civilian populations. Control measures such as engagement criteria, weapon control status and posture can all be impacted through the management or mismanagement of population. Commanders should also integrate intelligence collection teams, along with Civil Affairs and PSYOP teams into planning efforts to better inform the commander of the risks inherent with conducting urban operations.

Isolate Threats

One of the four defeat mechanisms, isolation, is a tactical mission task that seeks to separate enemy forces from population, friendly units, and support capabilities. Isolation also extends to psychological and information operations.[9] Physical isolation is a task in which an ABCT is particularly well designed. Circling back to the Russian-Ukrainian conflict, the battle of Mariupol provides a good example of the need to achieve isolation for offensive forces and conversely to defeat isolation for defending forces.

The siege of Mariupol began on 24 February 2022 and ended on 20 May 2022.[10] Located in Ukraine's Donetsk Oblast, Mariupol is an urban littoral and port city whose seizure was vital to Russian forces having far side control of the land bridge between Russia and Crimea. The location of Mariupol is such that for an attacking force to successfully seize the city, isolation was crucial.[11] Attacking forces consisted of elements from the Russian 8th Combined Arms Army and the 150th Motor Rifle Division.[12&13] Russian naval, air, and special operations forces were also involved.[14]

Having achieved the initiative, Russian forces encircled Mariupol and began assaulting the city in early March.[14] This event led to Russian forces achieving large-scale isolation of the city of Mariupol. The situation mostly remained unchanged, with small gains until mid-March, when Russian forces began to achieve greater isolation, internal to the city, separating northern Mariupol from the southern port.[15] Territorial gains were slow but continuous until early April.[16] At which point, early predictions were made that Mariupol would capitulate days afterwards. However, Ukrainian forces repelled waves of Russian advances, delaying the eventual seizure of the city.

By mid- April, Russian forces captured most of the city, including the port of Mariupol, but still faced an isolated pocket of Ukrainian fighters in the eastern part of the Azovstal factory.[17] Notably, Ukrainian forces were able to repel Russian for another month until officially surrendering on 17 May.[18]

Several take aways from the Russian attack on Mariupol include the need for combined arms to achieve encirclement and breakthrough strong point defenses as the fight continues. Artillery bombardment was crucial in the opening days of the battle and use of armored vehicles and high explosive munitions helped address pockets of active Ukrainian resistance. Next is the need for speed and tempo to achieve encirclement. Russian forces were able to encircle the city in a matter of days. Thereby preventing additional reinforcements or breakout. Finally, while Russian forces successfully isolated pockets of Ukrainian forces and steadily made territorial gains. Russian forces were considerably delayed by the Azovstal strongpoint. The reason for this roadblock could be attributed to the air-bridge that enabled steady supplies and reinforcements to the factory.[19] Russian fighters, while able to achieve physical isolation leading up to the Azovstal factory, were unable to achieve psychological isolation as the constant flow of reinforcements bolstered the Ukrainian will to fight, prolonging the battle for another month.

The ABCT is well suited to isolate threats in urban terrain. The speed, firepower, and psychological impact of the armored formation allows for a speedy isolation of the area and to surround a city, as the Russians demonstrated during the onset of the battle of Mariupol. At NTC, one of the most well-known operations is the seizure of the central corridor. Famous pieces of terrain like the racetrack, iron triangle, and moose gardens serve the specific purpose of allowing an attacking force to achieve isolation of the city of Razish. From my observations and experience, most ABCTs who cycle through NTC understand the need of this large-scale isolation of Razish and tend to fare well. On the other hand, as an operation progresses further in a city, ABCTs need to restructure based on operational needs.

Commanders should consider using cavalry squadrons and scout platoons to achieve or break isolation. To achieve isolation, attacking forces must determine what LOCs to interdict and defending forces must know which LOCs to protect. Interdiction of critical LOCs in the urban area is a task in which the Armored Cavalry Squadron is well suited, as cavalry forces possess the speed, agility, firepower, and protection necessary to disrupt enemy outside the urban area during the offense. On the other hand, urban terrain can constrain the cavalry unit's capabilities in the defense. Therefore, it is essential for cavalry forces be placed in the peripheries or outside of the urban area and use tasks such as a delay in a wider area defense.[20]

Tying it All Together

The common theme in all these examples is that urban operations are a collaborative affair, which includes the use of infantry, armor, engineers, civil affairs, and other enablers. For companies and platoons to start thinking about how to fight in urban terrain, I offer the following recommendations:

1. Implement combined arms teams early and often in at training glidepath.

Drawing on the first fundamental of urban operations, how a unit task organizes for urban operations is crucial to success. When to implement this task organization is up to the commander. But units can start forming combined arms teams early in a unit's training plan (UTP). Chapter 2 of ATP 3-06.11 shows that combined arms teams can be implemented to as low as the platoon level. This chapter also provides some scenarios in which a combined arms team with more infantry vs. armor may be more appropriate and vice versa. Junior officers and NCOs should feel empowered to find creative solutions to the complex problem sets presented to them from the urban environment.

Additionally, implementing less common enablers such as multi-functional teams, civil affairs, and psychological operations would prove useful is reinforcing the principles shared in ATP 3-06.11 that population and infrastructure must be addressed in operational planning.

2. Incorporate urban training sites into all collective training exercise.

Battalions and Brigades can complete all UTPs without ever incorporating MOUT operations. While it is more common to see infantry companies and battalions incorporate aspects of urban operations into a UTP, there is a large absence of urban planning in ABCTs. Mission Essential Tasks (METs), and Training and Evaluation Outlines (T&EOs) are largely devoid of urban scenarios.

A common tendency is to view urban operations with an all-or-nothing perspective (i.e., rural vs. megacity). However, urban operations incudes a spectrum of terrain types from a couple of buildings to skyscrapers and from small villages to metroplexes. Units are sabotaging lethality when conducting situational training exercises and live-fire training exercises with the belief that urban operations are irrelevant.

A way to combat this complacency is to include urban training sites and areas at home-stations into every training exercise. Using MOUT sites like this will help planners and commanders start thinking about how to address the urban environment, even if it is not the primary focus of training. Used in this way, units can still achieve their METs. A unit can increase or decrease the focus of urban operations into a collective training based on the size of the training audience and the T&EO/MET needing to be trained.

Conclusion

The publication of ATP 3-06.11 shows

that efforts are being made to address the doctrinal void of combined arms in urban terrain. However, tactical units still lack the training proficiency to perform operations. This is particularly true in ABCTs, which may still prioritize an infantry-centric approach to urban operations." During my attendance at UOPC, I was surprised to see there were only two infantry officers in a class of fifty students. Branches ranged from armor to field artillery and from civil affairs to legal. The primary theme in the above listed vignettes is that urban operations are not owned by one combat arm. Urban operations are all encompassing. High intensity urban operations up the ante on munitions, logistics, personnel, and medical resources. Urban operations also change battlefield geometry, slows operational tempo, and place command and control in the hands of small unit leaders. Yet, many still struggle to correct the original issue posed by OC/Ts at Fort Irwin, that units struggle to combine arms in the city.

The need to address the urban issue is not unwarranted. The increase in urbanization trends combined with current conflicts like Ukraine along with Gaza indicate an increasing need for units, specifically ABCTs, to think about the implications of operating in an urban environment. My hope is that this paper served as a primer to help planners and commanders start thinking how to fight and win in the urban environment. This endeavor will build more proficient, collaborative units who are comfortable combining arms in urban terrain.

Captain Logan S. Yates currently serves as the company commander for Assault Company, 1st Battalion, 8th Cavalry Regiment, 2nd Armored Brigade Combat Team, 1st Cavalry Division. Prior to this command, CPT Yates commanded Headquarters and Headquarters Company. Previously, CPT Yates also served with the 11th Armored Cavalry Regiment as an Executive Officer for both Headquarters and Headquarters Troop and Easy Troop, as well as a Platoon Leader for Easy Troop. CPT Yates's military education includes completion of the Infantry Basic Officer Leadership Course, Basic Airborne Course, Cavalry Leader Course, and Maneuver Captains Career Course, and CPT Yates holds a Bachelor of Science degree in Exercise and Wellness from Brigham Young University.

NOTES

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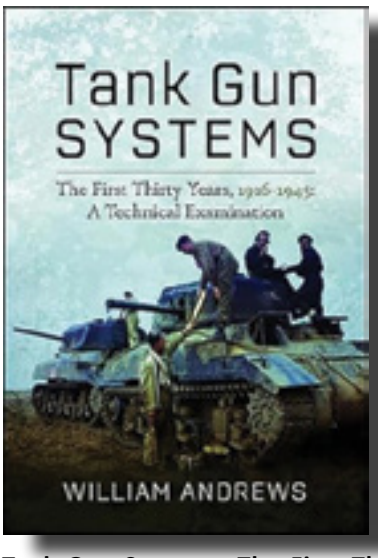
BOOK REVIEWS



Tank Gun Systems: The First Thirty Years, 1916-1945: A Technical Examination by William Andrews, Havertown, PA: Pen and Sword Books, 2023, 576 pages, $62.95

Dr. William Andrews is a retired Canadian armor officer with extensive instructional experience at the Royal Military College of Canada. His latest book describes "and examines the main gun systems of main battle tanks of the first half of the twentieth century." This is a focused work that does not deal with a given tank system mobility, protection, or operational and tactical employment. Rather, his book "examines the basic components of a given gun system." At the same time, his work explores the maximum "impulse and energy generated by firing some of the munitions available that must be absorbed by the gun recoil system."

Organized around twenty-five chapters, the first six chapters thoroughly examine a given tank main gun. His explanation of the components of the gun system is systematic and enlightening. The effectiveness of ammunition and ballistic considerations along with recoil management forms the groundwork for his assessment of a given country's tank main gun. Numerous mathematical formulas are shown to enrich understanding of the physics for a given main gun operation.

This book covers five types of cannons developed by the British and French during World War I. Also, covered are the works of Germany, France, Great Britain, the Soviet Union, Italy, Japan and Czechoslovakia during the interwar years. Insights on barrel and breech construction, ammunition, recoil systems and firing mechanisms are provided. Discussions in each section are enhanced by numerous diagrams and photos. Gun control, sights, crew composition and duties, as well as recoil load, round out Dr. Andrews' commentary. A detailed bibliography is found at the conclusion of each chapter.

The concluding section examines the prominence of tanks on the World War II battlefield. This leads the author to examine several approaches in the development of new and more lethal gun systems and ammunition. The complexities of gun mounts, sights, traversing and elevation mechanisms improved during the six years of intense combat on a variety of battlefields. As the Second World War progressed, the role of the tank switched " from tank carrying cannon to support infantry to cannon having, first, an anti-tank role and then becoming dual-purpose, e.g., being able to attack armored as well as softer targets and fortifications." Of particular interest is Dr. Andrews' remarks on German tank development of the 37mm and 75mm gun systems. As with each chapter in this section, photos, diagrams, and detailed explanations allow the reader to appreciate the responsiveness of a given country to battlefield challenges. German tank sights development along with ammunition improvements increased the lethality of German tanks. To keep pace with these developments, crew training for the Germans was simplified by placing crew men in the same location for each successive model improvement.

As to be expected, other World War II combatants was not idle while the Germans improved their armored force. The Soviet Union started hostilities with tanks armed with 37 and 57mm main guns. As the German threat increased, the Russians up gunned their T-34 force from a 76mm to 85mm with likewise improvements to tank ammunition and sighting systems. The United States Army fielded three large caliber main guns during the war. The 37mm along with a 75mm gun served on the M 3 Lee. The 37mm was also found on the M3 and M5 Stuart light tanks as well as the M 8 armored car. As the war progressed, the Sherman series tanks hosted the 75mm then 76mm gun systems. While the 90mm was found on the limited number of fielded M26 Pershing tank, the total number of these tanks did not justify examination by the author.

Dr. Andrews has produced a detailed examination of the functionality of a tank's main gun system. He clearly explains the complexity of recoil and gun sight system. His detailed description of tank ammunition and their effect on a given type target is clear and understandable. Master of his subject, Dr. Andrews' organization and detailed discussion of various tank main gun systems is remarkable.

While a superb reference book, the length of the book will deter some from purchasing it.

Maneuver commanders will find it has limited applicability to the employment of an armored unit. However, the work certainly deserves a prominent place in the reference section of a military oriented library.

RETIRED COL D. J. JUDGE

Blitzkrieg in the West: Then and Now
by Jean Paul Pallud, Pen and Sword. 2022, 640 pages, $89.95

In May 1940, the German Wehrmacht lured the British and French armies into Belgium with a feint attack, then broke through the center of the Allied line with a spearhead of seven armored divisions. In 10 days the panzers reached the Channel coast, trapping the Allied armies in a giant pocket. Within weeks the British had fled the continent and the French had surrendered.

Blitzkrieg in the West: Then and Now, is a narrative and pictorial chronicle of the campaign. As fits its considerable size – 640 oversize pages, more than 1800 photographs and maps – this is really three books in one. First, it is a fantastic album of photographs of the 1940 campaign. The photos portray the equipment and soldiers of all the combatants, each picture carefully captioned and, in many cases, accompanied by an image of the same location circa 1990 (the book was first published in 1991 and has not been revised; I reviewed the 2022 reprint). Of special interest to the Armor audience, there are many, many interesting photographs of the tanks and other armored vehicles used by the opposing forces. The book is handsomely produced. It is printed on glossy paper that serves the photographs well, and has the kind of tight binding that is mandatory for a hardback this large.

The second book embedded in this volume is a highly detailed account of the campaign, at times down to the platoon level. In addition to the well-known events, such as the German armored breakthrough via the Ardennes Forest and the Dunkirk evacuation, the author discusses more obscure actions, such as the fighting in the Alps between French and Italian forces. What might have been a dry narrative is enlivened by Pallud's extensive use of first-person combat accounts, including harrowing descriptions of tank engagements.

The third book is the author's analytical discussion of the campaign. Pallud provides detailed descriptions of the plans and preparations of each side. His interpretation of the campaign is often insightful and makes clear that the outcome of the campaign was contingent, not preordained. The author does not fall into the trap of some campaign histories, especially older ones, of claiming that the Allied forces did not have will to fight or were overwhelmed by vastly larger German armored forces. Pallud shows that the Allied tank inventory was larger than the German and comparable, if not superior, in quality, and that French morale was good. He concludes that "Neither was the morale or the ability of the men found wanting — it was simply the way the armour was used that made the panzers superior" (P. 57).

In particular, Pallud highlights the misuse of the French 7th Army, a powerful, mobile force that was originally deployed behind the front as the Allied central reserve. However, the French C-in-C, Gamelin, decided (against the advice of his field commanders) to move the 7th Army to the Allied far left flank for a dash into southern Holland. His objectives – which included supporting the Dutch and securing the approaches to Antwerp – perhaps had some logic, but the decision was catastrophic, as it left the French with no concentrated, mobile reserve once the German armor broke through the Allied center. As Pallud notes, if 7th Army "had been available to be rushed to where it was needed, in the Sedan sector, the entire balance of forces in the fight to stem the breakthrough would have been altered" (P. 152). History could easily have taken a different path in 1940.

The book has its faults. There are some surprising gaps in the campaign narrative, such as limited discussions of the key German breakthrough at Sedan and the bitter fighting for the critical town of Stonne on the southern flank of the German advance. The maps are rudimentary, created by overlaying labels and symbols on modern, rather than 1940, Michelin maps. A bit more academic apparatus – more citations and a bibliography – would have been welcome.

At least one of Pallud's conclusions is open to debate. Like virtually all chroniclers of the 1940 campaign he castigates the French for deploying many of their tanks with infantry formations rather than solely in armored divisions. Yet during World War II more American tank battalions were used as independent formations (63), often attached more or less permanently to an infantry division, than assigned to armored divisions (48). After the war, the U.S. Army concluded that not enough armor had been allotted to the infantry divisions. The French, who had no shortage of tanks and fielded several powerful armored divisions in addition to the tank units assigned to the infantry, failed in the operational-level deployment and tactical handling of their armor, not necessarily in their conception of how tanks should be used for infantry support.

But these are minor criticisms. Blitzkrieg in the West will be a valuable and even essential addition to any library on the critical campaign of May-June 1940. For further reading, the best analytical account is The Blitzkrieg Legend: The 1940 Campaign in the West, by Karl-Heinz Frieser. Also outstanding is The Breaking Point: Sedan and the Fall of France, 1940, by Robert A. Doughty, former head of the history department at West Point.

STAN KAPLAN

SGT Fred Benning, namesake of Fort Benning, GA was awarded the Distinguished Service Cross by President Woodrow Wilson for his actions near Exermont, France on 9 October 1918. SGT Benning went on to serve two terms as mayor of Neligh, Nebraska.

Target, Target, Cease Fire!

U.S. Army photo by Scott Darling

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